



Lung Function Among Non-Smoking Cotton Mill Workers

KEYWORDS

Byssinosis, cotton mill workers, pulmonary function tests

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ABSTRACT Objective: To determine the effect of cotton dust exposure on lung function among cotton mill workers.

Materials and methods : 100 non-smoking cotton mill workers and control group comprising of similar number of healthy non-smoker subjects with no occupational exposure were taken with age group between 20-50 years. The pulmonary function test was performed and compared by paired t-test.

Results: The mean \pm SD age of cotton mill workers and unexposed healthy subjects was 35 ± 8.3 and 37 ± 7.8 years respectively. The respiratory symptoms were significantly more compared to unexposed subjects. There was significant reduction in overall mean values of FEV1 and FVC. The mean FEV1 predicted value for exposed and unexposed was 70% and 80% respectively. The mean FEV1 predicted in those with < 3years of exposure was 75% and those with > 3yrs of exposure was 69% ($p < 0.005$)

Conclusions: Cotton mill workers are at an increased risk of developing occupational lung diseases. Therefore regular health check-ups, personal protective measures and proper ventilation are highly recommended.

INTRODUCTION

India is one of the leading cotton producing country with nearly 20 million people working in cotton industry¹. Exposure to cotton dust is considerable during handling and processing of cotton. With high levels of respirable dust in the air cotton mill workers are vulnerable to lung diseases like Chronic obstructive pulmonary disease, occupational asthma, byssinosis etc. Most of the workers are unaware of this negative impact on health and they do not take any safety precautions.

Byssinosis is characterised by chest tightness, shortness of breath, cough on the first day of work after a period of absence. Hence it is also called "Monday dyspnoea". The type of dust, duration of exposure, concentration of dust and the size of particle influence the effect on lungs². Apart from clinical history, lung function tests play a significant role in the diagnosis of these diseases. Even today in developing countries most of the workers in cotton mills are unaware of this occupational health hazard. Therefore this study was conducted to investigate the effects of cotton dust on lung function.

MATERIALS AND METHODS

The present study was conducted in a cotton mill in Guntur district, Andhra Pradesh, India. Around 100 cotton mill workers were included in our study. Workers above the age of 50, smokers and those with previous history of asthma, cardiac or respiratory ailments were excluded from the study. All the workers included in our study are aged between 20-50 years and had been working for at least 1 year. A healthy non-smoker control population of 100 who had never worked in cotton mill was taken. All the subjects were matched for age and anthropometric measures. Detailed clinical history and examination was done.

Both the test and control groups underwent pulmonary function tests (PFT). All the PFTs were carried out at fixed time around 11:00 a.m to 2:00 pm. The parameters taken

into consideration were forced expiratory volume in one second (FEV1) and forced vital capacity (FVC). Results were statistically analysed using paired t-test and p values were calculated.

RESULTS:

There was no significant difference between the two groups in terms of anthropometric measures. The mean age of the cotton mill workers was 35 ± 8.3 and that of control group was 37 ± 7.8 (table 1). The overall symptomatology was significantly more prevalent in cotton mill workers compared to the control group (table 2). The mean duration of exposure in cotton mill workers was 5.5 years. The values of FEV1 and FVC were markedly lower in exposed group compared to control group ($p < 0.001$). The mean FVC (percentage of expected value) for the control group was 92% whereas it was 70% for the test group. The mean FEV1 predicted value for the exposed and control group was 70% and 85%, respectively (table 3).

Table 1: Comparison of Age, Height, Weight between exposed and control group

Parameters	Control subjects	Cotton mill workers	P value
Age (years)	37 ± 7.8	35 ± 8.3	Not significant
Height	161.3	167.5	Not significant
Weight	63.8	65.2	Not significant

Table 2: Comparison of symptoms between exposed and unexposed group

Parameters	Cotton mill workers	Control subjects	P value
Cough	20%	10%	<0.001
Monday morning chest tightness	15%	-	<0.001
Breathlessness	19%	2%	<0.001

Table 3: Comparison of FEV1, FVC and FEF 25-75 between exposed and unexposed group

Parameters	Cotton mill workers	Control subjects	P value
FEV1(% predicted value)	70%	85%	<0.001
FVC(% predicted value)	70%	92%	<0.001

DISCUSSION:

Cotton dust is composed of cotton fibres, bacteria, fungi, insects and various chemicals including pesticides. It has sensitising property and leads to allergic manifestations. Its exposure leads to both acute and chronic respiratory problems. Workers exposed to cotton dust were compared with unexposed subjects matched for age, height and weight. All the subjects included were non-smokers.

The cotton mill workers had more respiratory symptoms compared to the control subjects. In our study 20% of workers reported cough, 15% reported Monday morning chest tightness and 19% complained of breathlessness. Christiani, et al, reported higher prevalence of respiratory symptoms in cotton textile workers³. Nagoda, et al, also reported that exposed workers had higher prevalence of breathlessness (24.5%) compared to unexposed group⁴. The prevalence of higher respiratory symptoms in cotton mill workers in our study was in agreement with the of study Nafees, et al⁵.

In the present study subjects exposed to cotton dust showed decreased lung function compared to control group which is in agreement with the done by Fishwick, et al⁶. The mean FEV1 and FVC were decreased in the study by Sangeeta Vyas which correlated with our results⁷. FEV1 is significantly decreased in cotton workers which is in accordance with the study of Bakirci N, et al⁸. Cotton workers with respiratory symptoms had greater declines in forced expiratory volume in one second (FEV₁) and forced vital capacity (FVC). Workers exposed to cotton dust who were not suffering from respiratory complaints also had lower lung function. Similarly in a study by Wang, et al, there was a drop in FEV1, whether byssinosis was present or not⁹.

Among exposed the decline in FEV₁ was proportional to the duration of exposure. The mean FEV₁ predicted in those with < 3 years of exposure was 75% and those with > 3 yrs of exposure was 69% (p<0.005)

In developing countries respirable dust concentrations are still above the permissible limits where no strict regulations are followed. Workers in the cotton industry should be educated about this health hazard and its standardized protection measures. It is also advised that the workers should undergo periodic health check-ups. These tests will allow identification of susceptible workers so that they can take safety precautions and appropriate treatment if already affected.

CONCLUSION:

This study stresses the fact that cotton mill workers are highly vulnerable to occupational lung diseases. There may be both acute and chronic presentations. There is also strong relationship between duration of exposure and reduction in lung functions. Workers those without symptoms may also have reduced lung function tests. Therefore regular health check-ups, personal protective measures and proper ventilation are highly recommended.

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