PEAK EXPIRATORY FLOW RATE;

Comparison of cotton mills workers and healthy controls in Multan.

Dr. Salman Ayyaz, Dr. M. Azam Mushtaq, Dr. Shakeel Ahmed Khan

ABSTRACT… Objective: To ascertain the effects of cotton dust on the peak expiratory flow of cotton mill workers in comparison with the healthy controls who never exposure to the cotton dust. **Setting:** Outpatient Department of Pulmonology, Nishtar Hospital, Multan. **Period:** August 2011 to March 2012. **Material and methods:** A total of 200 male subjects (100 healthy controls and 100 cotton mill workers) who strictly met the inclusion criteria were selected from the OPD. **Results:** The peak expiratory flow rate (PEFR) (L/min) of cotton mill workers was significantly lower as compared to the control subjects and this impairment was directly proportional to the duration of exposure to the cotton dust in the mail. **Conclusions:** It was concluded from the study that the peak expiratory flow rate was decreased in the cotton mill workers.

Key words: Byssinosis, Peak expiratory flow rate, Respiratory function test.

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INTRODUCTION

The work of many researchers from time to time led to the idea that ill health may be the sequel of an imbalance between human beings and their environment[1]. In the present era of modernization and automation these diseases have increased tremendously. Respiratory disability is defined by WHO as a reduction in exercise especially secondary to impaired lung function and the resultant social and occupational disadvantage is designated as a handicap[2].

Different respiratory diseases related with occupational like asbestos, silicosis etc. are influenced by the type of dust, duration of exposure and the concentration and size of airborne dust in the breathing zone. A similar disease, known as byssinosis is caused by exposure to cotton fibres and flax dust at cotton and textile mills[3].

The cotton dust is an airborne dust. Its particle sizes are variable in length. The smallest size of cotton fibre is about 2 mm in diameter. All the particles with aerodynamic diameter more than 2 mm are deposited in the nose and pharynx. Particles between 3-10 mm in diameter are deposited in the tracheobronchial tree. Particles between 0.1-3 mm are deposited in the alveoli[4].

Cotton dust consists of ground up plant matter, cotton fibres bacteria, fungi, pesticides and contaminants, which may have accumulated during the growing, harvesting and subsequent processing or storage procedures[5]. The main sources of dust production in cotton mills where the mean annual dust exposure is above 100 ug/m^3 are ginning room, blower room, card room and during spinning. The excess decline in lung function can be expected at mean cotton dust exposure of 200 ug/m^3 annually and exposure must be reduced to 100 ug/m3 annually in order to prevent dust related decline in the lung functions[6].

It has been suggested that prolonged exposure of cotton dust enhances the risk developing airway hypersensitivity and obstructive lung disease like chronic bronchitis, asthma[7]. Workers exposed to cotton dust may develop mild fever, shortness of breath, chest tightness and difficulty in breathing which the workers experience on the first day back at work after the period of absence[8].

The peak expiratory flow (PEF) (L/min) is the

maximum flow of air that can be achieved in expiration during the forced vital capacity. It is a good index of degree of air flow limitation in the first 2 months of expiration during the forced vital capacity maneuver[9]. PEF is now a well established clinical and epidemiological measurement test. It provides an objective assessment of functional changes relative to environmental and occupational exposure determining the acute or chronic disease process[10]. It reflects not only the lung volume and the state of the airways but also the expiratory muscle force. In patients with obstructive lung diseases several peak flows are persistently low and represent collapsing large airways[11].

Present study was carried out to ascertain the effects of cotton dust on the peak expiratory flow of cotton mill workers in comparison with the healthy controls who never exposure to the cotton dust.

MATERIAL AND METHODS

This study was carried out at the outpatient Department of Pulmonology, Nishtar Hospital, Multan from August 2011 to March 2012. A total of 200 male subjects (100 healthy controls and 100 cotton mill workers) who strictly met the inclusion criteria were selected from the OPD.

RESULTS

The age of the subjects included in the study was 20 to 40 years. Height of the mill workers and controls was between 160-190 cm. Mean PEFR was 602.82 in controls and 472.05 in mill workers.

Out of 100 mill workers, 31 (31%) were working in spinning, 26 (26%) in blowing room, 24 (24%) in ginning room and 19 (19%) in card room (Table-I).
Shortness of breath was the major symptoms in mill workers as shown in table-II.
Mill workers was distributed in 4 groups according to duration of service (Table-III).

Department	No. of workers	%age
Spinning	31	31.0
Blow room	26	26.0
Ginning	24	24.0
Card room	19	19.0

Table-I. Distribution of mill workers in different departments (n=100)

Department	No. of workers	%age
Shortness	43	34.0
Cough	30	30.0
Chest tightness	27	27.0

Table-II. Frequency of presenting symptoms (n=100)

Department	No. of workers	%age
1-5 years	18	18.0
6-9 years	30	30.0
10-14 years	24	24.0
> 14 years	28	28.0

Table-III. Groups of workers according to duration of service (n=100)

DISCUSSION

In spite of the fact that Pakistan is an agriculture based country with cotton as a cash crop, a very few related studies are available. One study showed almost the similar results as this present study[12]. The present study revealed that the peak expiratory flow of cotton mill workers is significantly decreased as compared to the healthy controls and this clearly supports the hypothesis of this study. PEF is significantly abnormal (decreased) in the cotton mill workers as compared to the healthy controls. Further it is depicted that the impairment of respiratory is in direct relation with the duration of service in the cotton mill workers. It is also shown that the impairment in PEFR may occur at

earlier stages of joining the cotton mill i.e. within 1 to 1.5 years.

The initiation and the severity of symptoms and impaired pulmonary function seem to be associated with the magnitude of the dust level[13]. Mill workers employed in the initial processing units of the cotton mill, as were included in this study, develop the lung function impairment and subsequently byssinosis at earlier stages[14]. This is particularly true when the fibre is of low quality and/or contains much dusty material[21].

Results of a long term follow up study concluded that the chronic exposure to cotton dust is related to both work specific and non-specific respiratory symptoms with impairment of pulmonary functions at earlier stage[15]. A similar follow up study of 15 years showed a progressive decline in ling functions with associated symptoms in the cotton mill workers as the duration of their service increases[16].

Altin and co-workers reported decline in lung functions and prevalence of byssinosis in cotton mill workers in Turkey[6]. They also showed that significance decline occurred from 5-15 years of exposure. The present study shows that the decline may occur only after 1-1.5 years of exposure at the cotton mill and further work up is required for this early onset of impairment of lung functions.

Many old studies conducted with the cotton mill workers also revealed the similar results. Gundevia et al demonstrated the influence of duration of exposure in cotton mill workers and found that the pulmonary function was significantly decreased in the employees between 1-10 years of duration of exposure[17]. Later Merchant et al reported that the greater the exposure of workers to the cotton dust the greater will be the impairment in lung functions[18].

Berry et al reported that the lung functions decline in cotton mill workers as compared to the control subjects[19]. Like wise another study by measuring pulmonary functions in subjects chronically exposed to cotton dust found that pulmonary functions in cotton mill workers were significantly decreased than controls.

Meo and colleagues reported that the cotton mill workers had significantly lower peak expiratory flow rate than control subjects. They further concluded that this impairment was directly proportional to the duration of exposure to cotton dust in the cotton mill[9].

The results of the present study with respect to the pulmonary function, peak expiratory flow, the cotton mill workers in comparison with the control subjects show that the PEFR in cotton mill workers is significantly impaired as compared to the healthy controls and this impairment is directly proportional to the duration of exposure. These results are compatible with the above mentioned results of the studies conducted throughout the world as well as one study conducted in Pakistan.

Atopy, smoking, quality of cotton fibre and the use of pesticides are important varieties which can influence the development or expiratory disability in the cotton will workers. It is, therefore, recommended that further research should be carried out to unmask the factors responsible for the unsatisfactory health status of the cotton industry workers.

CONCLUSION

It is concluded from the study that pulmonary function is significantly impaired (decreased) in comparison with the healthy controls.

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AUTHOR(S):

1. **DR. SALMAN AYYAZ**
   Department of Pulmonology,
   Nishtar Medical College/Hospital, Multan
2. **DR. M. AZAM MUSHTAQ**
   Department of Pulmonology,
   Nishtar Medical College/Hospital, Multan
3. **DR. SHAKEEL AHMED KHAN**
   Department of Pulmonology,
   Nishtar Medical College/Hospital, Multan

Correspondence Address:
Dr. Salman Ayyaz
Department of Pulmonology,
Nishtar Medical College/Hospital, Multan

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