ORIGINAL ARTICLE

A CROSS SECTIONAL STUDY OF RESPIRATORY CONDITION IN NON TEXTILE AND TEXTILE WORKERS
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HOW TO CITE THIS ARTICLE:

ABSTRACT: The purpose of this study was to determine the prevalence of respiratory symptoms among cotton-ginning workers. Byssinosis is a respiratory disease caused by inhalation of cotton dust for prolonged period of time. This is most frequently occurs in the cotton mill workers. The Aim of the study is 1. Determining the proportion of workers experiencing difficulty in breathing, chest tightness, chest pain, coughing, wheezing and phlem. 2. To evaluate the pulmonary function test variation in textile workers with non-textile workers. The present study was conducted on three groups (I, II, III) of male subjects of age ranging 30 to 40 yrs, 41 to 50 yrs & 51 to 60 yrs. And each of the group is divided again into textile workers & non-textile workers. A structured questionnaire enquiring about the respiratory health was administered to the employees. And our result shows the Byssinotic symptoms were too high in cotton mill workers than control group. The pulmonary function test shows a significant reduction in lung capacity, and the mean values of FVC, FEV1, FEV1%, FEF 50%, were on negative side among cotton mill workers compared to control group and which is statistically significant.

KEYWORDS: Textile workers, non-textile workers, Forced Vital Capacity (FVC), Forced Expiratory Volume in First Second (FEV1), FEV%, Forced Expiratory Flow Between 25-75% (FEF 25-75).

INTRODUCTION: India is the third largest producer of cotton in the world, accounting for ~14% of the global cotton production. And over the last decade, India has achieved a significant quantitative increase in cotton production. In 2000–2001, cotton fields in India covered 8.58 million ha, with a mean yield of 278 kg/ha and total production of 14.0 million bales/year. By contrast, in 2010–2011, the area under cotton production was already 11.14 million ha, with a mean yield of 496 kg/ha and total production of 32.5 million bales/year.¹ As with exponential growth with cotton production, the workers involved in cotton industries too have increased.

The word byssinosis is derived from Latin which means fine, soft, white fibers. Byssinosis is a syndrome characterized by dyspnoea of gradual onset on first working day after leave or absence from work in same group of workers exposed to dust in same vegetable fiber industries.² Typical signs and symptoms in byssinosis are chest tightness, breathlessness, dyspnoea, upper respiratory tract irritation and dry cough. These are major cause of anxiety and disability.

Cotton dust when breathed in irritates the lungs and exposed workers experience the following symptoms: difficulty in breathing, chest tightness, coughing and wheezing. The current analysis was limited to the objective of: 1. Determining the proportion of workers experiencing difficulty in breathing, chest tightness, chest pain, coughing, wheezing and phlegm. 2. To
evaluate the pulmonary function test variation in textile workers with non-textile workers. A cross sectional study was conducted among workers in a cotton spinning mill.

Recent industrialization and globalization are changing the Indian occupation morbidity drastically. Exposure to thousands of allergic agent present in vegetable dust is a grousing cause of work related illness of respiratory system. Recognition of Byssinosis as an occupational lung disease has been delayed mainly because of the absence of characteristics physical and X-ray signs indicating pathology in lungs. Although, measures to control the dust in the cotton mills were instituted about 50 years ago, the incidence of Byssinosis leading to ultimate respiratory disability still remains a serious problem.

METHODS AND MATERIALS:
The methods adopted for the present cross sectional study are:-

- Consent taking.
- History taking.
- General & systemic examination.
- Study procedure.
- Equipment used.

Study subjects were selected from Guntur (AP) area in the age group of 30-60 years. For the study subjects exclusion criteria and inclusion criteria applied.

EXCLUSION CRITERIA:

- Malignant or benign disorder.
- Renal disease.
- C.N.S. disorders.
- Endocrine disorders.
- Congenital abnormality.
- Obesity.
- Alcohol/Tobacco addicts.
- Skeleton- Muscular abnormality.

INCLUSION CRITERIA:

- In the Age group of 30- 60 years.
- Healthy individual.
- Height 1.6 meters or above.

All the participants were informed about the purpose of study nature, and informed consent have been obtained. A general and systemic examination was carried out. This study is approved by Institutional Ethical committee.

The present study was conducted on various age groups of human being subjects ranging from 30 - 40 years, 40 – 50 years and 50 – 60 years male who are physically and clinically in good health i.e no of physically disabled. To avoid the anthropometric variation all the textile workers and control group individuals are taken from height range of 1.6 miters. The subjects considered for the study are divided into 3 groups.
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**Group I A:** Males non-textile workers, age 30 – 40 years (control).

**Group I B:** Male textile workers, age 30 – 40 years.

**Group II A:** Males non-textile workers, age 40 – 50 years (control).

**Group II B:** Male textile workers, age 40 – 50 years.

**Group III A:** Males from non-textile workers, age 50 – 60 years (control).

**Group III B:** Male textile workers, age 50 – 60 years.

The method adopted for determination of lung functions, on volunteers i.e., industrial male workers, of age group between 30 and 60 years and to compare the results with normal male healthy volunteers of the same age group. They were from different religions, communities and of same economic status. 150 cotton mill workers & 150 control subjects between 30-60 years of age as per exclusion/inclusion criteria were selected. The study was conducted on Mondays (which is first working day after rest) on computerized spirometer Spl-95. Pulmonary functions were recorded i.e. FVC, FEV1, FEF25%-75%, PEFR.

**RESULT:** The anthropometric measurements were comparable for all the groups, so that it will not affect the outcome of study. The Byssinotic symptoms were too high in cotton mill workers than control group (Table 1).

The pulmonary function test shows a significant reduction in lung capacity. The mean values of FVC, FEV1, FEV1%, FEF 50%, were on negative side among cotton mill workers compared to control group (Table 2, Table 3, and Table 4) and which is statistically significant.
Byssinotic symptom | Cotton mill workers. | Control group
--- | --- | ---
Chest tightness | Group I: 51 | Group II: 53 | Group III: 58 | Control group: 9
Chest pain | Group I: 53 | Group II: 55 | Group III: 56 | Control group: 10
Difficulty in Breathing | Group I: 45 | Group II: 48 | Group III: 50 | Control group: 8
Frequent cough | Group I: 33 | Group II: 39 | Group III: 44 | Control group: 13

Table 1: prevalence (%) of the Byssinotic symptoms among Cotton mill workers and Control group

<table>
<thead>
<tr>
<th>PFT</th>
<th>Cotton mill workers</th>
<th>Control group</th>
<th>T Value</th>
<th>P Value</th>
<th>Crude value</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FVC</td>
<td>4.467</td>
<td>0.074</td>
<td>4.98</td>
<td>0.15</td>
<td>15.342</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>FEV1</td>
<td>3.585</td>
<td>0.051</td>
<td>4.077</td>
<td>0.115</td>
<td>19.563</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>FEV1 %</td>
<td>80.4</td>
<td>0.68</td>
<td>82.48</td>
<td>0.441</td>
<td>12.832</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>FEF50%</td>
<td>4.104</td>
<td>0.0789</td>
<td>4.462</td>
<td>0.108</td>
<td>13.391</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Table 2: Comparison of PFT values among cotton mill workers and control group of age group 30 to 40 yrs.
### Table 3: Comparison of PFT values among cotton mill workers and control group of age group 41 to 50 yrs

<table>
<thead>
<tr>
<th>PFT</th>
<th>Cotton mill workers</th>
<th>Control group</th>
<th>T Value</th>
<th>P Value</th>
<th>Crude value %</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>3.98 ± 0.04</td>
<td>4.15 ± 0.09</td>
<td>8.634</td>
<td>&lt;0.001</td>
<td>0.17 4↓</td>
</tr>
<tr>
<td>FEV1</td>
<td>2.934 ± 0.02</td>
<td>3.254 ± 0.063</td>
<td>24.222</td>
<td>&lt;0.001</td>
<td>0.320 10↓</td>
</tr>
<tr>
<td>FEV1 %</td>
<td>73.79 ± 0.974</td>
<td>78.6 ± 2.2</td>
<td>9.996</td>
<td>&lt;0.001</td>
<td>4.81 6↓</td>
</tr>
<tr>
<td>FEF50%</td>
<td>3.239 ± 0.013</td>
<td>3.914 ± 0.043</td>
<td>1.683</td>
<td>&lt;0.001</td>
<td>0.675 21↓</td>
</tr>
</tbody>
</table>

### Table 4: Comparison of PFT values among cotton mill workers and control group of age group 51 to 60 yrs

<table>
<thead>
<tr>
<th>PFT</th>
<th>Cotton mill workers</th>
<th>Control group</th>
<th>T Value</th>
<th>P Value</th>
<th>Crude value %</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>2.39 ± 0.012</td>
<td>2.49 ± 0.03</td>
<td>16.06</td>
<td>&lt;0.001</td>
<td>0.1 4↓</td>
</tr>
<tr>
<td>FEV1</td>
<td>1.892 ± 0.032</td>
<td>2.021 ± 0.024</td>
<td>16.170</td>
<td>&lt;0.001</td>
<td>0.119 6↓</td>
</tr>
<tr>
<td>FEV1 %</td>
<td>74.7 ± 0.65</td>
<td>78.61 ± 1.801</td>
<td>10.215</td>
<td>&lt;0.001</td>
<td>3.91 5↓</td>
</tr>
<tr>
<td>FEF50%</td>
<td>2.436 ± 0.090</td>
<td>2.908 ± 0.081</td>
<td>18.684</td>
<td>&lt;0.001</td>
<td>0.472 19↓</td>
</tr>
</tbody>
</table>
DISCUSSION: The present study demonstrates that there is a significant decrease in lung functions in the cotton mill workers. The probable cause for the decrease in pulmonary function test is the accumulation in peri bronchial lymphoid and connective tissues along with varying degrees of wall thickening and remodeling in terminal and respiratory bronchioles arising from each pathway. Bronchiolar walls with marked thickening contained moderate to heavy amounts of carbon and mineral dust and wall thickening is associated with increase in collagen and interstitial inflammatory cells including dust laden macrophages. The study by Edwards et al has shown that in larger bronchi of the Byssinotic there was a higher percentage of muscle and glands with corresponding lower percentage of connective tissues and cartilage. While in segmental bronchi no much significant changes were observed. Decrease in FVC, FEV1 and FEV1% indicates an obstructive pattern of lung disease. Decrease in FEF50% indicates a pathology involving the larger airways due to cotton dust.

Exposures to a number of organic dust or chemical agents may result in occupational asthma or COPD. Measurements of change in FEV1 before and after a working shift can be used to detect an acute bronchoconstrictive or inflammatory response. For example, an acute decrement of FEV1 over the first work shift of the week is a characteristic feature of cotton textile workers with byssinosis (an obstructive airway disorder with features of both asthma & ch. Bronchitis).

This is probably due to a histamine releasing substance. In addition to histamine release, exposure to cotton dust causes irritation in the upper respiratory tracts & bronchi, which after prolonged exposures slowly progresses to chronic obstructive pulmonary disease. In early stages there may be decline in FEV1, which may be symptomless in some workers. Within, one or two days, most symptoms tend to disappear except for irritation in the upper respiratory tract. There is chest tightness due to temporary accumulation of platelets in the pulmonary capillaries after organic dust exposure. Cotton dust act as irritant to both the alveoli and bronchus. As the disease
progresses, the chest tightness is accompanied by breathlessness, the symptoms becoming worse & persisting for a longer time. In its late stages the diseases resembles chronic bronchitis & emphysema.\(^6\)

The pathology underlying chest tightness and respiratory pathway irritation is probably a cell-mediated inflammation in the airway epithelium. This sensitivity could vary between individuals, rendering certain workers more prone to inflammation. In cotton-dust–exposure experiments, it was shown that the presence of a subgroup of T-lymphocytes was closely related to the decrease in FEV1 after exposure.\(^7\)

With the increased understanding of the pathogenesis of cotton-dust–induced disease, alternative measures such as determinations of cytokine levels in nasal lavage or sputum are increasingly used. Higher levels of IL-8 have been detected in nasal lavage fluid of cotton workers.\(^8\)

**PREVENTION:** This study indicates that cotton-mill workers are vulnerable to respiratory impairment due to exposure to cotton dust in the working environment. We recommend that cotton-ginning workers use a mask to avoid dust entering the respiratory tract. Pictorial information about the use of masks should be displayed in the workplace to make illiterate workers aware of this need. Regular medical check-ups of workers is also important for early identification of workers experiencing breathing problems that may be related to the working environment.

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