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Study of Respiratory Symptoms and Pulmonary Function in Cotton Textile Workers

Omid Aminian, Seyed Amir Reza Mozafari, Khosro Sadeghniiat Haghighi, Farzaneh Chavoshi, Maryam Saraie, Nazanin Izadi

MD, Center for Research on Occupational Diseases, Tehran University of medical sciences, Tehran, Iran

ABSTRACT

Objective: Workers in the cotton textile factories who are exposed to cotton dust are at risk for occupational pulmonary diseases. We conducted a study in order to evaluate chronic effects of exposure to cotton dust on respiratory health and pulmonary function.
Method: In this study we enrolled 140 cotton textile workers and 150 office workers as control group. Information was collected using standardized questionnaires, physical examination and spirometric measurements. Statistical methods used in our study included the Chi square test for categorical variables and independent sample T- test for continuous variables. Also logistic regression test were used for possible confounders.
Results: Cotton textile workers had more respiratory symptoms as compared with control groups. Greater declines were seen in forced vital capacity (FVC), forced expiratory volume in first second (FEV1) and FEV1/FVC in cotton textile workers. This reduction was significant in FEV1/FVC which is indicator of obstructive pattern in the exposed group.(P-Value: 0.04)
Conclusion: According to our study, cotton textile workers are at risk for developing respiratory symptoms and loss of pulmonary function .Physical examination and spirometry can detect adverse respiratory effects in the early stages.
KEYWORDS: Cotton Dust, Cotton textile works, Respiratory symptoms, pulmonary function.

1. INTRODUCTION

In the textile industry, exposure to cotton dust is responsible for respiratory disease such as byssinosis and chronic bronchitis (1-3). Byssinosis is characterized as chest tightness and changes in pulmonary function on the first working day in the week; also it may progress to other days. Along with continuous exposure the disease may progress and finally respiratory failure occurs (1). However, non specific respiratory symptoms such as chronic cough, sputum and dyspnea in the workers exposed to cotton dust have been more than those without exposure (1, 4).

There are conflicting results in previous studies, some studies showed that long term exposure to cotton dust may result in chronic respiratory disease and accelerated loss of pulmonary function (1, 3, 5). Also there is a relationship between concentration of cotton dust and loss of pulmonary function (6) .Some studies indicated that with prolonged exposure, respiratory symptoms may became chronic and irreversible (1, 7). Whereas other studies failed to find chronic effect (8-9). Some studies have focused on acute airway response; however chronic changes from exposure to cotton dust remain unclear.

The present study was conducted to explore the occurrence of respiratory symptoms and assess the relationship between exposure to cotton dust and loss of pulmonary function.

MATERIALS AND METHODS

Our study was designed as a retrospective study. We enrolled 290 individuals in our study. Among them, 140 (131 male and 9 female) were cotton textile workers who had a working history for at least 2 years, and 150 office workers (96 male and 54 female) as our control group.

A modified version of American Thoracic Society (ATS) standardized questionnaire was administered to collect information (10). A demographic questionnaire was used for evaluation of age, sex, education, duration of exposure, smoking habit, respiratory symptoms such as cough, sputum, dyspnea and chronic bronchitis (productive cough on most days of a week for at least 3 months a year for at least 2 consecutive years).

All of cases with a history of respiratory diseases such as asthma, bronchitis, emphysema and rhinitis at the time of employment were excluded from the study.

***Corresponding Author:** Nazanin Izadi, MD, Center for Research on Occupational Diseases, Tehran University of medical sciences, Tehran, Iran.

After filling the questionnaires, physical examination was done by a physician and pulmonary function tests were conducted pre-shift by a trained technician.

Spirometry was done by spirometry apparatus (COSMED) and all spirometric maneuvers were done in accordance with ATS criteria. Spirometry parameters that were measured include FVC, FEV1, and FEV1/FVC and FEF25-75%.

The values of pulmonary function tests were considered as our outcome variables, where as age, sex, smoking history and working history were predictive variables.

Data was analyzed with SPSS 14. Statistical methods used in our study included the Chi square test for categorical variables and independent sample T- test for continuous variables. Also logistic regression test were used for possible confounders. Statistical significance was considered at the 0.05 level and all statistics reported with their 95% confidence interval.

Proposal of this study was confirmed in ethics committee of Tehran University of Medical Sciences and informed consent was taken from all of the participants.

RESULTS

The demographic characteristic of the study are shown in table 1. Most of the workers in both groups were male, and the prevalence of smoking was higher in cotton group. There were statistically significant differences in sex and smoking. (P-value <0.05)

The prevalence of respiratory symptoms is presented in table2. Cotton workers had higher frequency of symptoms of cough, sputum and productive cough. Also calculated odds ratio shows that frequency of respiratory symptoms in cotton exposed group is 5 times more than non-expose group.

Among 291 cases who underwent spirometry, 226(77.66%) had normal pattern and 65 (22.34%) had abnormal pattern. Table 3 presents pulmonary function tests in both groups. Among the measured spirometry indices (FVC, FEV1، FEV1/FVC, FEF%25-%75), only decline in FEV1/FVC was statistically significant.

Table 4 presents the effects of duration of exposure and smoking and on the pulmonary function patterns, as shown only smoking has a marginally significant correlation with obstructive pattern.

Table 1: Demographic characteristic in the cotton exposed workers in comparison with non - exposed group

Variables	Cotton textile worker (n=141)	Office workers (n=150)	P-Value
Age (mean ±SD)	33.34 ± 7.27	32.80 ± 8.81	0.672
Duration of employment (mean ±SD)	9.89 ±7.89	8.85 ± 6.69	0.604
Sex n(%) male	131(93.57%)	96(63.58%)	<0.001
female	9(6.43%)	55(36.42%)	
Smoking n (%)	20 (14.29%)	7 (4.64%)	0.03

NS: not significant. Significant: (P- Value ≤ 0.05)

Table 2: Respiratory symptoms in cotton exposed workers in comparison with non-exposed group

Variables	Cotton textile worker (n=141)	Office workers (n=150)	OR (95% CI)	P-value
Cough	14(%10.00)	3 (%1.99)	5.03 (1.47-17.14)	0.003
Sputum	14 (%10.00)	3 (%1.99)	5.03 (1.47-17.14)	0.003
Productive cough	4 (%2.86)	0	-	0.03
Dyspnea	10 (%7.28)	11 (%7.14)	-	0.19

Significant : (P- Value ≤ 0.05)

Table 3: Pulmonary function tests in cotton exposed workers in comparison with non-exposed group

Variables	Cotton textile worker (mean± SD)	Office workers (mean± SD)	P-value
FEV1/FVC	80.97 ± 6.52	84.05 ± 5.51	0.04
FEV1	88.77 ±11.80	90.66 ± 10.68	0.15
FVC	86.45 ± 10.89	88.24 ± 9.92	0.07
FEF25-75%	97.39 ± 24.57	95.35 ± 21.95	0.45

Significant: (P- Value ≤ 0.05)

Table 4: The effects of different variables on pulmonary function patterns

Variables	Obstruction		Restriction	
	OR	P-value	OR	P-value
Duration of exposure	1.07	0.13	1.03	0.10
Smoking	5.07	0.05	1.69	0.24

DISCUSSION

This study has investigated the prevalence of respiratory symptoms and lung function in workers exposed to cotton dust. Respiratory symptoms were more prevalent in cotton textile workers than in office workers. Similar results were reported by other studies (3-4, 11-13). It is reasonable because accumulation of cotton dust in the airways resulted in increasing sputum production and cough (14-15).

Cotton textile workers showed a reduction in FEV1/FVC, FEV1, and FVC in comparison with office workers. This reduction was significant in FEV1/FVC which is indicator of obstructive pattern in the exposed group. Of course, we must consider that byssinosis can cause both obstructive and constrictive patterns but usually predominant pattern is obstructive (16-18). This is similar to the findings of Ramaswamy(19). Decrease in pulmonary function values has been shown in parameters including FVC, FEV1 and FEF25–75% in the cotton textile workers (20-21). Most of the studies showed obstructive pattern. Of course, it is considerable that results of some studies have been different from our study which can be due to difference in smoking habits, working environment, the rate of cotton dust ventilation and type of personal protective equipment (18).

In our study, significant relationship has been detected between smoking and obstructive pattern (13-14). In linear regression analysis, smoking was the only confounding factor on the obstructive pattern which has a statistically significant effect; however, there has been no significant confounding factor on the constrictive pattern. Similar to our study, Bakirci could find a significant association between smoking and obstructive pattern and clinical manifestations(22).

Also, we found a significant correlation between loss of pulmonary function with years worked in cotton textile factories and exposure to cotton dust. Some studies showed a significant association between loss of pulmonary function with working years and high concentration of cotton dust (19).

The level of cotton dust exposure and gender disproportion between case and control group are the major limitations of this article.

According to our study, cotton textile workers are at risk for developing respiratory symptoms and loss of pulmonary function .Physical examination and spirometry can detect adverse respiratory effects in the early stages.

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