RESEARCH STUDY

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Pulmonry function test in spinning and weaving workers in Iraq

Article Information

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Abstract

Background : The cotton factories have difference steps, spinning and weaving are van important parts of the factories. Cotton industry workers are exposed to various hazards in the different departments of textile factories. The major health problems associated with cotton dust are respiratory problems. Cotton workers display an excess of lung function abnormalities when compared to a community control population.

Aim of Study: This study assessed the effect of exposure to cotton dust in spinning and weaving workers on the lung function in Iraq, by measuring Forced Vital Capacity (FVC),Forced Expiratory Volume in the first second(FEV1), FEV1/ FVC Ratio, and Forced Expiratory Flow 50%(FEF50%),with varying degree of reduction in lung function.

Methods:151 workers exposed to cotton dust were enrolled in the study, and 100 non exposed workers were selected as control. The age of the workers ranged between 20 to 60 years. Both groups were smokers and non smokers, has no chronic pulmonary disease or symptoms during the time of the study. Sprometric study was used for measuring the lung function.

Results: Statistically significant reduction in FEV1and FEF50%were found in exposed workers when compared to control. Lung function indices were not affected with increasing duration of exposure to cotton dust nor to smoking.

Conclusion: Exposure to cotton dust in spinning and weaving workers may result in reduction in the pulmonary function and may lead to respiratory diseases. So improvement in protective measures is recommended.

Introduction:

Thousands of workers are exposed to cotton dust while busy in collecting cotton from the field s and in large textile mills during carding, blowing ,spinning and weaving[1].

Respiratory problems have been reported from most countries with a textile industry, while the prevalence is decreasing in developed countries, it continues to be high in developing countries [2]. In Turkey it was 14.2%in the
Past decade[3].

Exposure to cotton dust is associated with acute airway responses [4] and chronic airway obstruction It generally believed that acute airway responses are reversible in the early stage or after a short- term exposure[6,7]. In contrast,chronic airway obstruction may result from continuous and prolonged exposure [5, 8]. Irreversible changes in pulmonary function along with life threatening conditions associated with cotton exposure have been mentioned [9, 10].

The prevalence of obstructive, restrictive and mixed type of functional impairment of the lung was found to have direct relation with the dust concentration and duration of exposure [11].

Although the mechanism of acute bronchoconstriction and chronic airway limitation remain un clear, epidemiologic studies and animalexperiments have suggested that airway inflammation and immune e response are involved in the process and are triggered by gram-negative bacterial endotoxin contaminating the cotton dust[12].Some studies suggested that atopymay play a role, possibly in non specific allergic hypersensitivity [13]. The mechanism of chronic airway response in cotton textile workers remains unclear[14]. The oxidant/ antioxidant theory postulate that an excess of oxidant in the lung
Promotes cellular and tissue damage, and is the major initiator of the disease process[15, 16]. Most studies indicate that adverse respiratory effects

are more closely associated with cotton fiber dust[17, 18].

Dust in the weaving shed is different, as a large part of it consists of size (a coating of starch, or other material, applied to yarn before it is submitted for weaving),which is liberated during the weaving process. Application of a coat of sizemay also prevent cotton dust from being liberated during the weaving process[19].
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Methods: The study population comprised those working in the spinning and weaving factories in Iraq.151 workers enrolled in the study.Spirometric test was done by the staff of NationalCenter for Occupational Health and Safety for the workers who visited these center factoriesfor routine examination. They had been exposed to cotton dust for a period of 1-32 years.

An unexposed (control) group consisted of 100 persons who were not exposed to dust who visited the National Center for Occupational Health and Safety for routine checkup (as the teachers and clerks), belonged to the same age groups.

Data collection was effected by way of an interviewer-administered structured questionnaire, to determine the name,age, gender, duration of exposure, smoking, and history of past disease(s).

Lung function tests were carried out with a vitalograph spirometer for both the exposed and control groups. The procedures were carefully explained and demonstrated to each subject and then the tests were carried out. Forced vital capacity(FVC), forced expiratory volume in 1 second(FEV1),the ratio of FEV1/FVC, and forced expiratory flow 50% (FEF50%) were measured using a vitalograph spirometer. The recording was done with each subject standing, with using nose clips, and with the lips firmly applied around the disposable mouthpiece. The subject inspired maximally and then expired as forcefully and rapidly as possible into the vitalograph. Three attempts were made and the best of the three spirogram was selected.

Statistical analysis

Statistical analysis was performed with the statistical package for social sciences (SPSS) Version 19 and Microsoft Excel 2010 for configuration of data, tables and figures.

Numerical data were described as mean, standard error; also, comparison among more than two groups was done using analysis of variance (ANOVA) and independent sample t-test for comparison between two groups.

Categorical data were described as frequency and percentage; comparison done by Chi -square test.

P-value of 0.05 was used as the level of significance.

Results: **Table 1** showed the gender of exposed and control groups , the total number of exposed group is151 , 171one,are male (93.44%)and only twelve are female(6.56%).While the control group was one hundred ,sixty four of them were male(64%) and thirty six were female(36%).

Table 2 showed the Comparison between exposed and control groups in abnormal PFT in which there is statistically significant difference in FEV1 between exposed and control groups (p≤0.05),and highly statistical significant in the ratio of FEV1/FVC(p≤0.001).while the FVC,FEF50% did not differ significantly between the exposed and the control groups .

Table 3 showed the Comparison between duration of exposure and abnormal PFT in which there is no statistically significant difference in FVC, FEV1, the ratio of FEV1/FVC, and FEF 50% among the three groups of duration (1-9 years,10-19 years,20 years and more) .

Table 4 showed the Comparisonbetween smoker and abnormal PFT in which there is no statistically significant difference in FVC, FEV1, the ratio of FEV1/FVC, and FEF50% between the smokers and nonsmokers groups.

Table 1 Gender of exposed and control groups

+		Study groups			
		Exposed group		Control group	
		Count	%	Count	%
Gender type	Male	75	49.7%	64	64.00%
	Female	76	50.3%	36	36.00%
	Total	151	100.00%	100	100.00%

Table 2 Comparison between exposed and control groups in abnormal PFT

	Study groups				
	Exposed group		Control group		p value
	Mean	Std. Error	Mean	Std. Error	
FEV1	89.44	1.44	93.79	1.60	0.048*
PVC	91.70	1.61	89.77	1.32	0.393^{NS}
ratio	98.18	0.88	96.51	0.80	0.161^{NS}
FEF 50%	83.51	2.44	92.02	3.28	0.035*

NS= not statistically significant (p>0.05). * = statistically significant (p≤0.05).

Table 3 Comparison among duration of exposure and abnormal PFT

		Mean	Std. Error	Sig.
FEV1	1-9 years	87.72	2.84	0.803^{NS}
	10-19 years	89.23	2.01	
	≥20 years	90.49	2.69	
PVC	1-9 years	91.04	4.46	0.227^{NS}
	10-19 years	89.17	1.62	
	≥20 years	95.25	3.30	
Ratio	1-9 years	98.48	1.47	0.o97^{NS}
	10-19 years	99.79	1.09	
	≥20 years	95.96	1.54	
FEF 50%	1-9 years	85.76	4.36	0.267^{NS}
	10-19 years	86.77	4.03	
	≥20 years	78.27	3.71	

NS= not statistically significant (p>0.05).

Table 4 Comparison between smoker and abnormal PFT

	Study groups							
	Exposed group				Control group			
	Smokers		Non-smokers		Smokers		Non-smokers	
	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error
FEV1	87.93	1.84	90.02^{NS}	1.86	94.95	2.51	93.48^{NS}	1.92
PVC	90.45	1.94	92.17^{NS}	2.10	89.48	2.16	89.85^{NS}	1.58
Ratio	97.02	1.74	98.62^{NS}	0.90	95.14	1.39	96.87^{NS}	0.95
FEF 50%	80.43	4.43	84.707^{NS}	2.93	92.57	8.03	91.87^{NS}	3.59

NS= not statistically significant (p>0.05).

Discussion: Occupational diseases in spinning factories as a result of inhalation of cotton fibers and dust in work place [19].

Perhaps exposure to dust in weaving is sufficiently irritant it is continuous exposure over a period can cause reduce ventilatory function [20].

In this study which composed of one hundred fifty one exposed workers, almost equal gender distribution, there is statistically significant difference in FEV1 and FEF50-% between exposed and control groups (p≤0.05).while the FVC, FEV1/FVC ratio did not differ significantly between the exposed and the control groups(p>0.05) .this result was in agreement with that of Xiaorong et al(14) which showed that exposure to cotton dust/ endotoxin is a significant risk factor for decline in FEV1.

The reduction of FEV1weaving workers could be due to the fact that these workersoften deal with ordinary cotton dust as well as dust from cotton which dyed with different chemicals, thereby exposing them to chemical irritants.

A longitudinal study over a period of 4 years reported thatthere is no significant decline in pulmonary function compared with preemployment measurement [21].

Bhaskar et al showed that the FVC, FEV1 and PEFR were significantly(p<0.001,p<0.01 and p<0.05 respectively|)lower in high dust exposure group in comparison to low dust exposure group[22].This indicate that the concentration of the dust has effect on spirometric parameters.

Evidence from pathologic studies of cotton workers inflammation and hyperplasia of the large airways[23].this suggest that the differences in the lung function patterns described may be related to these differences in pulmonary pathology.

In this study the exposed group divided into three subgroups according to the duration of exposure, there were no significant abnormalities between these subgroups. This result was in disagreement with that of Joseph et al [24].who showed significant differences were found in FEV1 for exposed workers according to the duration of exposure. possible explanation for the lack of relationship in our study that the chronic airway obstruction may be influenced by an inherited predisposition, as suggested by a Hang et al study(25).Bhaskar et al (22) showed that the percentage of workers having FEV1 decrease was more in 10_19 years exposure group than the 20-29 years exposure group .However the statistical test showed no significant difference between the two groups.

Smokers appeared to have more persistent adverse effects due to the interaction between exposure to cotton dust and smoking (18). In this study there was no statistically significant between smoking and abnormal PFT, this may be explained by the lack of data about the number of

ciggarate per day and duration of the smoking, and may be due to small size of smokers recruited in this study. This result in agreement with of Joseph et al (24), and in contrast with findings carried out in Taiwan study where smoking increase the risk of cotton related lung disease(26).
Limitation of this study is that inhalable cotton dust level in the different departments couldnot be measured.

CONCLUSION

This study showed that there significant relationship between exposure to cotton in spinning and weaving factories and abnormalities in pulmonary function test (forced expiratory volume in 1 second (FEV1),and forced expiratory flow 50% (FEF50%).These abnormalities in pulmonary function test not significantly affected by smoking or the duration of the exposure.
As a result of this effect of cotton on the respiratory tract, the recommendation is regular medical check-up for the medical workers, incorporating training workshops for the workers, regular sampling of air dust levels in different work areas to keep the levels below the permissible exposure limit.

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