Assessment of Lung Function among Wool Textile Workers in Al-Nassiriya Industry

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Abstract:

Background: Chronic exposure to wool dust is related to specific respiratory symptoms, due to high ambient dust concentration and the observed adverse effects on lung function.

Objective: to assess the pulmonary function of wool textile workers.

Methodology: A cross-section study which included 689 workers was studied at departments of Al-Nassiriya wool industry south of Iraq. Spirometric assessment was done by measuring forced expiratory volume during first second, forced vital capacity and forced expiratory volume during first second / forced vital capacity ratio for each workers by simple spirometry.

Results: pulmonary function test was abnormal for 16.6% of the sample, and 74.5% of workers with abnormal lung function were above 40 years of age.

Conclusion: The percentage of workers with abnormal lung functions is significantly related to the duration of employment.

Abbreviations: FVC: Forced expiratory Volume, FEV1: Forced expiratory Volume in 1 second, COPD: Chronic Obstructive Pulmonary Disease.

Key words: pulmonary function test, spirometry

Introduction:

Lung function test are used as a routine procedure for assessing and monitoring the respiratory disease. Pulmonary function tests are used to aid diagnosis, assess functional impairment and monitor treatment or progression of diseases.[1] Normal spirometric values are valuable reference tolls for this purpose. These indices have been shown to vary according to age, height, sex, and body size.[2] Spirometry is an important tool used to assess conditions such as asthma and Chronic Obstructive Pulmonary Disease (COPD). The maneuver is highly dependent on patients' cooperation and effort, and it's normally repeated at least three times to ensure reproducibility. Since results are dependent on patient cooperation, Forced expiratory Volume in 1 second (FEV1) and Forced Vital Capacity (FVC) can only be under estimated, never over estimated.[3] Testing should not conducted in a room colder than 17° C so the results must be converted to body temperature, barometric pressure saturated BTPS before the interpretation of spirometric results.[4]

Aims of the study:

The present study aims at:

1- Assessing the lung functions of wool workers in different departments in Al-Nassiriya industry by measuring FVC, FEV1 and FEV1/FVC percent for each worker by simple spirometry.

2- Finding out any association between lung function and variables such as (gender, duration of work, type of the job)

Materials and methods:

A cross sectional study was conducted during the period between the first of November 2006 to April 2007 in Al-Nassiriya textile industry.

Sample size: A total of 689 were selected by simple random technique from all departments of the industry.

Methods used for data collection:

1-Interview questionnaire, which includes the demographic data, duration of the work, age, gender and level of education.

2- Spirometry study for every worker: This test was done three times for each employee, and the highest value was taken. [5]

3- Normal lung function test:

Normal values are based upon the age, height, ethnicity, and sex of the person being tested. Results are expressed as a percentage. A value of the ratio of FEV1 to FVC (FEV1%) usually considered abnormal if it is less than 80% of the predicted value for that person [6,7]. To interpret ventilatory function tests in any individual, compare the results with reference values obtained from a well-defined population of

normal subjects matched with gender, age, height and ethnic origin by using similar test protocols; and carefully calibrated and validated instruments. [8]

Statistical analysis: Association between categorical variables were tested by the use of contingency tables and the calculation of x^2 (chi-square test). A value of $P < 0.05$ was considered to be an accepted limit for significance.

Results:

A total of 689 employees in the textile industry were included 233

33.8% females and 450 (66.1%) males.

The majority of the study population were employed in the washing department 22.5% ,followed by weaving , blending, carding, spinning , storage and engineering department (21 , 16.7 , 13.7 , 10.2 , 9.7 , and 6.5%) respectively and these was no significant difference between distribution of females and males in different departments . (Table 1)

Table 1. Distribution of subjects according to their working department in the industry.

Department	female		Male		Total	
	no	%	no	%	no	%
Washing	57	36.8	98	63.2	155	22.5
Weaving	53	36.6	92	63.4	145	21
Blending	37	32.2	78	67.8	115	16.7
Carding	35	38	57	61	92	13.7
Spinning	23	32.9	47	67.1	70	10.2
Storage	18	26.9	49	73.1	67	9.7
Engineering	10	22.2	35	77.8	45	6.5
Total	233	33.8	456	66.1	689	100.00

$X^2 = 1.309$, d.f =6, P Value = 0.971

Table 2 shows that the pulmonary function test was normal for 83.4 % of the sample. The highest percentage of abnormal lung function 21.8 was noticed in the age group 31-40 years 15.8% males and 6% females , but there was no significant differences between different age groups P value = 0.5 .

Table 2. Lung Function test according to age group and gender

Age	Lung Function test									
	Normal				Abnormal				Total	
	Females	%	Males	%	Females	%	Males	%	no	%
≤ 30	22	23.6	55	59.1	4	4.3	12	12.9	93	13.6
31-40	29	35.3	35	42.6	5	6.0	13	15.8	82	11.9
41-50	40	28.1	82	57.7	5	3.5	15	10.5	142	20.6
51-60	52	30.9	89	52.9	7	4.1	20	11.9	168	24.3
>60	61	29.9	110	53.9	8	3.9	25	12.2	204	29.6
Total	204	29.6	371	53.8	29	4.2	85	12.3	689	100.0

$X^2 = 2.435$, d.f =4, P value = 0.5

Table 3 shows that the percentage of worker with abnormal lung function was increased significantly p-value p=0.1 with the increase in the duration of employment (8.8, 13.3, 16.4, 18.1, 21.2) in duration of ≤5, 6-10, 11-15, 16-20, 21-25 respectively.

Table 4 shows that the highest percentage of abnormal lung function (24.51) was in workers in the washing department and the lowest percentage (4.5) was in the engineering department. There was a significant differences in the distribution of lung function test in the different department p-value=0.012.

Table 3: Lung function test of the textile workers by the duration of their employment.

Duration (yr)	Lung Function test					
	Normal		Abnormal		Total	
	no	%	no	%	no	%
≤5	87	91.2	8	8.8	95	13.8
6-10	91	86.7	14	13.3	105	15.2
11-15	107	83.6	21	16.4	128	18.6
16-20	145	81.9	32	18.1	177	25.7
21-25	145	78.8	39	21.2	184	26.7
Total	575	83.5	114	16.5	689	100

$X^2 = 13.54$, d.f =4, P. value = 0.01

Table 4: Lung function test according to the place of working in the industry

Department	Lung function test					
	Normal		Abnormal		Total	
	no	%	no	%	no	%
Washing	117	75.4	38	24.51	155	22.4
Weaving	121	83.4	24	16.5	145	21
Blending	97	84.3	18	15.6	115	16.8
Carding	78	84.7	14	15.2	92	13.3
Spinning	57	81.4	13	18.5	70	10.2
Storage	62	92.5	5	7.4	67	9.8
Engineering	43	95.5	2	4.5	45	6.5
Total	575	83.5	114	16.5	689	100.00

Discussion:

Exposure to wool dust cause pulmonary impairment and it is considered to be one of the major health hazards facing those working in wool textile industry. Monitoring its level in work place environment is essential to detect early physiological and pathological change before development of signs and symptoms. Lung functions test to detect pulmonary impairment is widely accepted test which can reflect the magnitude and extent of occupational exposure. [9] The majority of the employees were males 66.1% and this was expected to be seen in foundations such as the wool textile industry where the geographical location and social restriction implies male predominance.

Place of work: The study showed that those working in washing and weaving department had the highest percentage of the abnormal lung function test (24.5% and 21% respectively) table 4. This is explained by the fact that respiratory hazards were highly concentrated in these departments of wool textile. The employees in washing, weaving and blending departments were more exposed to risk of pulmonary impairments in comparison with other departments, there was a significant difference (P = 0.012). This agreed with other results reported by Carz, et al;[10]; David, et al [11] ; Wang, et al [12]who found that the abnormal lung function tests were associated with high exposure to dust and poor ventilation in washing and weaving departments.

Age of the employees and duration of the exposure:

From the result obtained from table 2 the majority of the employees in this study were at the age group >60 years, 29.6% of them with duration of work up to 21-25 years. And eventually a large number of them had a long duration of exposure this makes them more prone to ill effect of respiratory hazard exposure. This agreed with other study, Hrizdo [13], who referred to the estimated excess loss of lung function test for 50 years old, associated with 24 years of underground dust exposure. Moreover, Gihotker [14] reported that the impairment of lung function was significantly associated with increasing age and duration of dust exposure.

Conclusions:

The percentage of workers with abnormal lung functions is significantly related to the duration of employment. Washing and weaving department constitute the major work site for abnormal lung functions and pulmonary impairment and

represent (22.5%, 21%) respectively. Three quarters 74.5% of workers with abnormal lung function were above 40 years of age.

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