Physiological Changes And Clinical Findings In Females Textile Factory Workers

Saad Jone Hamza (M.B.Ch.B., D.M., FICMS., C.A.B.M.)[1]
Amjed Hassan Abbas (M.B.Ch.B., Ph.D. Medical physiology)[2]
Samir Sawadi Hamoud (M.B.Ch.B., D.M., Ph.D. Medical physiology)[2]
Al-Hashimiya General Hospital/Babil Health Directory[1]; Department of physiology/College of Medicine/ Babylon University[(2&3)]
Corresponding: E-mail: amjedhassan982@yahoo.com

الملخص

حوالي 60 مليون شخص في أنحاء العالم يعملون في صناعة النسيج أو الملابس. ظروف العمل والغبار الذي ينتج من معالجة القطن في الصناعات يمكن أن يسبب العديد من الحالات المرضية على صحة العمال. وقد وجدت العديد من الدراسات الحديثة وجود نسبة عالية من الأمراض المزمنة وخاصة انسداد الجهاز التنفسي المزمن (COPD) لدى هؤلاء العمال. الهدف من هذه الدراسة هو لتقييم أثر العمل في صناعة الغزل والنسيج من وجهة نظر فسيولوجية وسريريه. أجريت دراسة مستعرضة على 75 عاملة يعملن في مصنع الغزل والنسيج تم اختيارهن عشوائيا جميعهن إناث. تم جمع المعلومات من خلال المقابلة، بالإضافة إلى الفحص البدني وأجريت بعض التحاليل المختبرية اللازمة ومنها: حجم تكويم الخلايا (PCV)، عدد خلايا الدم البيضاء (WBC)، معدل ترسيب كريات الدم الحمراء (ESR)، قياس (السكر العشوائي في الدم (RBS)، اليوريا في الدم (Bur)، الكرياتينين في المصل (S_{Cr})، الألنين امينوترانسفيريز في المصل (ALT) ، الاسبارتيت امينوترانسفيريز في المصل (AST)، الفوسفاتيز القلوي في المصل (ALP))، تخطيط القلب الكهربائي (ECG)، فحص القلب بالأمواج الصوتية، أشعة الصدر السينية (CXR) وفحص البول العام (GUE) ، بالإضافة إلى فحص وظائف الرئة (PFTs) باستخدام مقياس وظائف الرئة المحمول.

وكانت النتائج كالأتي: متوسط مدة تعرض العاملات لغبار القطن كان 15.67 ± 4.86 من سنوات، كانت النسبة ألأعلى من العاملات يعانين من آلام أسفل الظهر(85٪)، في حين أن نسبة قليلة منهن مصابات بالاكزما (27٪)، التهاب المسالك البولية (23٪) في حين أن 2٪ من العاملات مصابات بتضخم البطين الأيسر بحسب تخطيط القلب الكهربائي وفحص القلب بالأمواج الصوتية. وفيما يتعلق بفحوصات الدم أظهرت الدراسة عدم وجود اختلاف معنوي كبير بين العاملات ومجموعة السيطرة ماعدا معدل ترسيب كريات الدم الحمراء (15,95 ± 26,8 مقابل 3,3 ± 8.3، قيمة $P \geq 0,05$). وفيما يتعلق بنتائج الجهاز التنفسي، نسبة عالية من العاملات يشكون من ضيق في التنفس (45.3٪)، وكان بعض منهن لا يشكون من إي أعراض (17.3٪)، وكانت شدة الأعراض من النوع المعتدل في معظم العاملات (24٪)، وأظهرت الدراسة أيضا انه لايوجد علاقة ذات تأثير معنوي بين مدة التعرض للغبار وشدة اعتلال التنفس ($r = 0.1$، وقيمة $P \geq 0,05$). نستنتج من هذه الدراسة إن هناك دليلا على وجود علاقة قوية بين التعرض لغبار القطن واعتلال الجهاز التنفسي، كما إن هناك نسبة معتبرة من العاملات لديهن مشاكل عضلية وجلدية، على الرغم من عدم وجود آثار هامة على فحوصات الدم ماعدا معدل ترسيب كريات الدم الحمراء.

الكلمات المفتاحية: النسيج، غبار القطن والعمال.

Abstract

About 60 million people worldwide work in the textile or clothing industry. The conditions of working and the dust that produced from processing of cotton in industries can cause many morbidities to the health of workers. Many recent studies have found a high ratio of chronic diseases especially chronic obstructive pulmonary disease (COPD) in those workers. This study was done to assess the effect of working in textile industry from physiological and clinical points of view. A cross-sectional study was conducted among 75 randomly selected textile factory workers, all subjects were females. Information was collected through interview, in addition to physical examination and some needed investigations were performed including: packed cell volume (PCV),white blood cell count (WBC), erythrocyte sedimentation rate (ESR), random blood sugar (RBS), blood urea (Bur), serum creatinine (Scr), serum alanine aminotransferase (ALT), serum aspartate aminotransferase (AST), serum alkaline phosphatase (ALP), electrocardiography (ECG), echocardiography, chest x-ray (CXR) and general urine examination (GUE), in addition to pulmonary function tests (PFTs) using portable medical spirometer.

The results of this study was shown that the mean duration of exposure of workers to cotton dust was 15.67±4.86 years, the higher percentage of workers had low back pain (LBP) (85%), while lower percentage of them had contact dermatitis (27%), urinary tract infection (23%), while 2% of workers had left ventricular hypertrophy as revealed by ECG and echocardiography. Regarding the mean values of blood parameters, the study showed no significant difference between workers and control groups apart from ESR changes (26.8 ± 15.95 vs. 8.3 ± 3.3 with $P \leq 0.05$). Regarding the respiratory findings, the highest percentage of workers complained from shortness of breath (45.3%), some of them had no symptoms (17.3%), severity of symptoms was moderate restriction in most workers (24%), the study also showed negative non-significant relation between duration of exposure and severity of respiratory impairment ($r = 0.1$, $P= 0.2$). In conclusion; this study provides evidence of a strong relationship between exposure to cotton dust and respiratory impairments, also there was a considerable percentage of workers had muscular and dermatological problems, despite no important effects on the hematological parameters except ESR.

Key words: Textile, cotton dust, workers.

Introduction

Occupational diseases represent the health hazards that caused by exposure within the work environment. They mean any chronic disease caused by activities or environmental factors at the work place[1]. The types of occupational diseases depend on the particular job, and the environment in which the job requires workers to endure[2]. Occupational diseases have a long latent period, most of them cannot be treated and all of them can be prevented[3]. Cotton dust is a heterogeneous mixture consists of plant matter, bacteria, fiber, soil, fungi, pesticides, and other non-cotton matter and contaminants[4]. Exposure to cotton dust has long been known to be associated with adverse respiratory effects and lung dysfunction[5]. In a study by Dube *et al.*,2013[6], they found reduced lung function in workers exposed to cotton dust. In addition to a study performed in Iraq, Mohammed and Baybeen found that workers in cotton textile factory had a significant restriction of lung function at age of 40-60 years as compared to control workers[7,8].

The musculoskeletal problems in textile factory workers occur due to excessive stress on the muscles, ligaments, tendons and bone, insufficient circulation to the musculoskeletal system and work that requires activity of a small group of relatively weak muscles[9]. In general, there were few information concerning the health effect of working in textile factories in Iraq. The aim of the present study is to reevaluate the effect of working in cotton textile factory on the body systems as judged by symptoms, clinical examination and investigations.

Patients and methods

The study involved workers group which consisted of 75 females workers in Al-Madhatiya Textile Factory in Babylon Province with a mean age (39.6±6.15) and control group which involved 65 healthy subjects both groups with mean age (47.14±11.82). The study was conducted in Al-Hashimiya General Hospital in Babylon Province in the period from January 2015 to November 2015. All subjects in both groups were females (because there was no male worker present in the factory), full history and physical examination were done to all subjects, the history included the following questions: age, materials used in the work, duration of employment, types and duration of complaints, family history of allergy, any chronic diseases, smoking, use of personal protective devices, history of allergy before work and Shilling grading of respiratory symptoms occurring was used which includes: grade (0): no symptoms,

grade (1): occasional symptoms, grade (2): symptoms on first day of the work, grade (3): symptoms on all days, and grade (4): severe permanent impairment[10]. Some needed investigations were performed including: PCV, WBC, ESR, RBS, B_{ur}, S_{cr}, ALT, AST, ALP, ECG, CXR, GUE and PFTs were performed using Mir spirometer and they were done for all the subjects in both groups.

Exclusion criteria: history of smoking, previous history of musculoskeletal and chronic systemic diseases.

Statistical analysis: All calculations and analysis was performed using the Statistical Package for the Social Sciences (SPSS version18). Some continuous variables were expressed as mean ± standard deviation (SD) while others were expressed as number and percentage. T-test was used to analyze categorical data. For all tests $p < 0.05$ was considered statistically significant. Simple linear regression was used to find the correlation and the correlation coefficient (r) was calculated.

Results

1. Demographic characteristics

The range of working duration in the factory was from 3 to 21 years with mean (15.67±4.86 years), no one of them found to use personal protective device, only 2% of them was hypertensive, the highest percentage of workers was married (71%) and the least percentage of them was unmarried (2%), the predominant percentage of workers completed secondary school (59%) and they had no chronic diseases (95%).

2. Distribution of some diseases in the workers

The study shows that the higher percentage of workers had low back pain (85%), while lower percentage of them had contact dermatitis (27%), urinary tract infection (23%), ECG and echocardiographic changes were signs of left ventricular hypertrophy which occurred in (2%) as shown in table (1).

Table (1): Distribution of some diseases in the workers

Disease	Positive NO.(%)	Negative NO.(%)
Low back pain	64 (85%)	11 (15%)
Contact dermatitis	20 (27%)	55 (73%)
Urinary tract infection	17 (23%)	57 (76%)
Left ventricular hypertrophy	2 (2%)	73 (98%)

3. Comparison of blood parameters between workers and control groups

The results of table (2) revealed that blood tests (PCV and WBC), renal function tests (blood urea and serum creatinine), liver function tests (ALT, AST, TSB and ALP) and RBS were within normal levels. The exception from that was in the level of ESR.

Table (2): Comparison of blood parameters between workers and control groups

Test	Result (mean ± SD)		
	Worker group	Control group	P value
ESR (mm/h)	26.8±15.95	8.3±3.3	0.04
PCV (%)	38.39±7.60	35.3±6.4	0.4
WBC*10^3 (cell/cubic mm)	8.24±2.3	6.33±3.2	0.2
Blood urea (mmol/L)	4.06±0.61	3.8±0.41	0.2
Serum creatinine(mmol/L)	65.61±6.94	55.9±5.83	0.4
ALT(mmol/L)	17.27±7.61	16.8±6.63	0.5
AST(mmol/L)	16.86±5.39	16.55±4.48	0.4
TSB(mmol/L)	13.67±5.93	11.77±4.44	0.1

S. ALK. Ph. (mmol/L)	58.71±18.57	56.64±12.67	0.3
RBS(mmol/L)	5.44±0.73	3.99±0.8	0.09

4. Spirometric findings

According to spirometric examination, this study illustrated that most of workers had abnormal pulmonary function tests (65.3%), and most of them had restrictive respiratory dysfunction (64%) and only 1.3% of those patients had obstructive type, as shown in table (3).

Table (3): Results of spirometry

Spirometric findings		Numbers	Percentage %	Total%
Normal finding		26	34.7	34.7
Abnormal findings	Mild restriction	14	18.7	65.3
	Moderate restriction	18	24	
	Severe restriction	15	20	
	Very severe restriction	1	1.3	
	Severe obstruction	1	1.3	
Total		**75**	**100**	**100**

5. Occurence of respiratory symptoms

Table (4) illustrated that the respiratory symptoms occurred occasionally in (52%) and it forms the highest percentage of workers and the least percentage occurred in first day of the work (2.7 %).

Table (4): Occurrence of respiratory symptoms during the work days

Respiratory symptoms		No.	Percentage (%)	Total (%)
No symptoms		13	17.3	17.3
Occurrence	Occasional	39	52	82.7
	First day from the work	2	2.7	
	All days of work	21	28	
Total		**75**	**100**	**100**

6. Relation between duration of exposure and severity of respiratory impairment

The study revealed non-significant negative relation between duration of exposure to irritants in the factory and severity of respiratory impairment as determined by level of forced vital capacity (FVC) with (r = 0.1 and P = 0.2) as shown in figure (1).

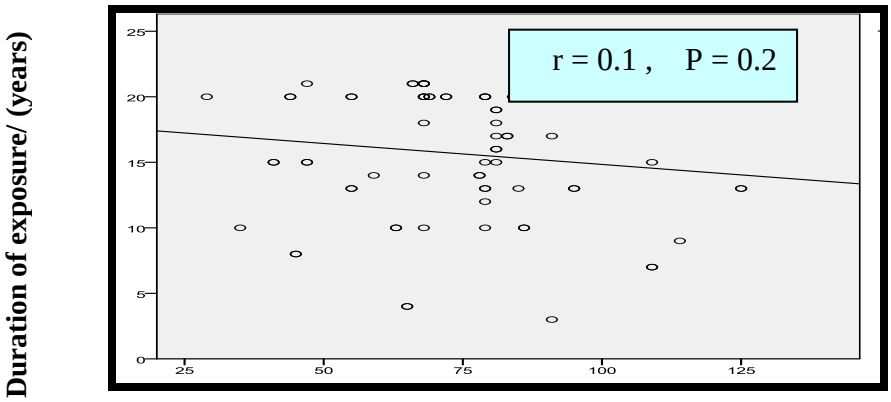

Figure (1): Relation between duration of exposure and level of forced vital capacity

Discussion

In this study, we aimed to assess the risk of works in textile factory on some body systems and the effects of exposure to cotton dust on respiratory system. It showed that the higher percentage of workers had low back pain while lower percentage of them had contact dermatitis and no important effects on the other examined body systems except respiratory system. Regarding libratory investigations, there was only significant difference in the mean level of ESR between workers and control groups.

In a study conducted by Paudyal P.1., *et al*, they found that mechanical load and psychological factors play an important role in LBP in textile factory[9]. In our study, we found the most important cause of LBP was the abnormal posture of workers i.e. sitting without support behind their backs.

In this study, there was considerable percentage of workers had contact dermatitis which might be due to the workers dealing with textile materials and dyes without wearing protective gloves and this was consistent with other study performed by[11].

This work has documented loss of lung function in association with exposure to cotton dust. Those operatives with work related symptoms had significantly lower FEV1 and FVC than asymptomatic workers. The study revealed that most patients had increase in severity of symptoms with increased duration of work. Restrictive lung dysfunction was the predominant in almost all workers and this agree with many studies[12,13]. In this factory, there was no proper vacuum system and the doors were closed during all the working time and this was responsible for the high percentage of workers who had restrictive lung dysfunction and this agreed with a study performed in Iran by Mehdi *et al.*, 2007 who found the cause of this finding was due to the progressive precipitation of dust in the lung over time[14].

Conclusion

Working in textile factories predominantly affects the respiratory, musculoskeletal and dermatological systems.

Recommendations

We recommend for obligatory use of personal protective tools by all workers, in addition to that the work place should have proper ventilation system in order to reduce the high prevalence of respiratory dysfunction. The workers should have proper sitting position with back support to reduce the musculoskeletal problems. Moreover all of them should have regular medical check-ups.

References

1. Tarlo, S.M. (2003). Workplace irritant exposures: do they produce true occupational asthma. Allergy Asthma Immunol; 90(5): 19.
2. Chatkin, J.M., Tarlo, S.M., Liss, G., Banks, D. and Broder, I. (2009). The outcome of asthma related to workplace irritant exposures: a comparison of irritant-induced asthma and irritant aggravation of asthma. Chest.;916(6):1780.
3. Sibel, O ., Beyza, A., Murat, K., Fatma, E., Göksel, K. and Sevin, B. (2012). Respiratory symptoms and pulmonary function of workers employed in textile dyeing factory in Turkey. Med J Malaysia; 67(4):375.
4. Dube, K.J., Ingale, L.T. and Ingle, S.T. (2013). Respiratory impairment in cotton-ginning workers exposed to cotton dust. Int. J. Occup. Saf. Ergon.;19(4): 55.
5. Raza, S., Fletcher, A., Pickering, C., Niven, R. and Faragher, E. (1999). Ventilatory function and personal breathing zone dust concentrations in Lancashire textile weavers. Occupational and Environmental Medicine; 56: 520.
6. Dube, K.J., Ingale, L.T. and Ingle, S.T. (2013). Respiratory impairment in cotton-ginning workers exposed to cotton dust. Int J Occup Saf Ergon.; 19(4): 551.
7. Mohammed, K.H., Ibrahim A. and Baybeen, K. Alselevany. (2008). Effect of cotton dust on lung functions. Ann. Coll. Med. Mosul; 34(2): 141.
8. Kogevinas, M., Zock, J.P., Jarvis, D., Kromhout, H., Lillienberg, L., Plana, E., Radon, K., Sunyer, J. and Antó, J.M. (2007). Exposure to substances in the workplace and new-onset asthma: an international prospective population-based study (ECRHS-II). Lancet.; 370(9584):336.

9. Paudyal, P., Ayres, J.G., Semple, S. and Macfarlane, G.J. (2013). Low back pain among textile workers: a cross-sectional study. Ethiop. J .Health Dev.;63(2):129.
10. American Thoracic Society. (2006). Dyspnea Mechanisms, assessment, and management: a consensus statement. Am. J. Respir Crit. Care Med.;159:321-340.
11. Suneja, T. and Belsito, D.V. (2008). Occupational Dermatosis in health care workers evaluated for suspected allergic contact dermatitis. Contact Dermatitis; 58(5): 285.
12. Kassahun, Alemu, Abera, K. and Gail, D. (2010). Byssinosis and other respiratory symptoms among factory workers in Akaki textile factory ،Ethiopia . Ethiop. J .Health Dev.; 24(2): 133.
13. Wang, X., Zhang, H.X. and Sun, B. (2005). A 20-year follow-up study on chronic respiratory effects of exposure to cotton dust. Eur Respir J.; 26: 881.
14. Mehdi, G., Masaharu, K., Mansour, R., Ali, R., Adel, M. and Hamid, R. (2006). Prevalence of Respiratory Symptoms among Workers in Industries of South Tehran, Iran. Industrial Health; 44: 218.