International Journal of Sociology and Anthropology Vol. 3(3), pp. 109-114, March 2011
Available online http://www.academicjournals.org/ijsa
ISSN 2006- 988x ©2011 Academic Journals

Full Length Research Paper

A study of the occupational health function among female textile workers

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Accepted February 2, 2011

Reduction of respiratory function among textile workers in the textile industry has been observed since the 1970s. A contaminant of raw cotton fiber and cotton dust, has been proposed as a affecting agent that may deteriorate the respiratory function. Present study aimed to find the factors associated with the deterioration of respiratory function among female textile workers. The sample consisted of 243 men above the age of 20 years who had worked for at least 3 months years in a textile factory and 235 female non textile workers of same area were studied. All the respondents were interviewed by a pretested questionnaire to gather information regarding the chest symptoms, certain personal characteristics and occupational history. Statistical analyses like Chi-square and odds ratio was done to determine the significant difference between female textile workers and female non textile workers. Univariate analysis of the factors for symptomatic byssinosis showed that dusty worksites, heavy smoking and duration of service years were significant. Logistic regression analysis showed that working in the scouring (odds ratio 11.0), spinning (odds ratio 4.7) and weaving sections (odds ratio 2.6), heavy smoking (odds ratio 12.4) and more than 10 years of service (odds ratio 2.8) were independent significant risk factors. Efforts to reduce dust levels in the working environment and to discourage smoking among textile workers need to be strengthened to minimize the risk of developing byssinosis.

Key words: Occupational health, respiratory problems, textiles workers, non textiles workers, FEV 1.0.

INTRODUCTION

In India the traditional public health concerns likes communicable diseases, malnutrition, poor environmental sanitation and reproductive health care get emphasis and priorities in the health policy.

Occupational diseases reflect health hazards brought on by exposure within the work environment. Due to lack of education, unaware of hazards of their occupations, general backwardness in the sanitation, poor nutrition and climatic proneness of this geographic region to epidemics aggravate their health hazards from work environment (Wang et al., 2003).

Traditionally labour-oriented markets are changing towards more automation and mechanization, at the same time general awareness about occupational safety, occupational and environmental hazard is limited in the society. With these structural changes the workers in low resources settings are more likely to be affected by the dangers of high technology than their counterparts in developed countries. Due to lack of education, lack of awareness about the hazards of their occupations, general backwardness in sanitation, poor nutrition and proneness to epidemics aggravate their health hazards from work environment (Vilanilam, 1980).

In 1956, an epidemiological study in the cotton industry in the UK documented the occurrence of respiratory problems like byssinosis (Schilling, 1956) Worldwide, India is the second largest producer of textile goods, which account for 20% of the national industrial output. Twenty million workers are employed in 1175 cotton mills across the country, representing a major occupational group (Datt and Sundaram, 1998). Exposure to cotton dust has long been associated with adverse respiratory effects and diminished lung function, which is most evident as byssinosis, a chest tightness experienced by workers on the first day back after a weekend or vacation break (Schilling, 1956; Roach and Schilling, 1960 and

Table 1. Distribution of textile workers (tw) and non textile workers (NTW) according to age group, sample size, section or sector of textile industry, reparatory problems and mean age.

Total workers in the factory	**1650**
Excluded	630: female workers in the factory, those <20 years of age and with a duration of exposure <3 months.
Remaining workers, 24% of this sample were taken = 243	1020 Non Textile workers=235
Distribution of this sample in different sections of the factory (TW): Spinning=57, Scouring=32. Weaving=65, Non-dusty=89.	Distribution of this sample in different sections of the factory (NTW): Agricultural labour: 78, Cotton troy maker: 39, Govt. servant: 21, House wife: 101
Respiratory problems (TW) = 95	Respiratory problems (NTW) = 15
No respiratory problems (TW) =128	No Respiratory problems (NTW) =201
Excluded because of chronic bronchitis(TW) =20	Excluded because of chronic bronchitis(NTW) =19
Mean age of TW females (Yrs.)	32.95
Mean age of NTW females(Yrs.)	33.63

Berry et al., 1973). Most studies indicate that adverse respiratory effects are more closely associated with cotton fiber dust (Castellan et al., 1984, 1987; Kennedy et al., 1987).

Respiratory problems have been reported from most countries with a textile industry. Its prevalence varied from 2% in the USA in the late 1970s, 4 to 63% in England in the late 1950s (Schilling, 1962) While the prevalence is decreasing in developed countries, it continues to be high in developing countries. In Turkey it was 14.2% in the past decade (Altin et al., 2002) there are few studies on respiratory problems among cotton textile workers in India. (Murlidhar et al., 1995; Mathur et al., 1993; Barjatiya et al., 1990; Jaiswal, 2004). Murlidhar et al. (1995) examined 273 cotton textile workers in Mumbai and found that 54 of 179 workers (30%) in dusty sections and 16 of 94 workers (17%) in non-dusty sections had respiratory problems. They also developed a questionnaire for the assessment of respiratory problems. (Murlidhar et al., 1995) In Uttar Pardesh, the textile industry is more than a century old but no study has assessed the magnitude of or the risk factors for respiratory problems. Present paper carried out a case–control study to find out the risk factors associated with the occurrence of respiratory problems.

SUBJECTS AND METHODS

The Bhadohi textile corporation limited has three textile mills. Present paper included all female, 20-49 years of age who had been working in the factory for at least more than 3 months. The details of the sample studied are shown in Table 1. The analysis was done for 243 subjects-57 from the spinning section, 32 from the scouring section 65 from the weaving section and 89 from the non-dusty sections and 235 non textile workers working in different industry or working in farm field or act as housewife. Present paper detected 95 cases of respiratory problems were found in the case of TW but in the case of NTW only 15 cases were found, of whom 28 had associated chest pain with cough. For the risk factor analysis, 67 cases with only symptomatic respiratory problems were included. The workers and controls were matched for age, sex and socio economic status. Subjects were chosen by purposive stratified sampling technique.

All the sampled individuals were interviewed with the help of an interview schedule prepared by adopting the standard questionnaire (Florey and Leeder, 1982) and the Byssinosis questionnaire used by Murlidhar et al., (1995). Before the interview, an informed consent was obtained from each worker by explaining the nature of the study and the confidentiality of the information required.

Information was collected on age, smoking behaviour, occupation, overcrowding and fuel used for cooking at home. Weight and height was accurately recorded, using standard techniques (Weiner and Lourie 1981). For the type of fuel used, the predominant fuel used over the past year was considered. Those smoking >10 cigarettes or bidis per day for the last 20 years or more were considered heavy smokers (smoking index of 20 pack-years). Overcrowding was classified according to the number of persons per room. Pulmonary function tests done for all the subjects included forced vital capacity (FVC), forced expiratory volume in the first second (FEV 1.0) and FEV 1.0/FVC. Three readings were taken after explaining and demonstrating the test procedure. The best of three readings was considered for analysis. The predicted value of FEV 1.0 for the concerned population was calculated and 80% of the predicted value determined. The data of textile workers were compared with control groups.

Statistical analysis

The data were analysed using statistical package for social

Table 2. Univariate analysis of risk factors for respiratory problems of TW and NTW in relation to worksite, section, smoking, duration of service, body mass index, fuel used for cooking and overcrowding.

Factors	Textile workers (%) (n=243)	Respiratory problems (%) (n=95)	Controls (%) (n=235)	Chi-square	Odds ratio (95% CI)
Work site					
Dusty section	63.4	74.5	86.7	6.5*	3.7 (1.3, 10.9)
Non-dusty section	36.6	25.5	13.3		1
Sections					
Scouring	23.5	24.5	11.0	11.0*	11.0 (1.9, 19.6)
Spinning	13.2	13.8	12.7		4.7 (1.9, 21.3)
Weaving	26.7	56.7	63.0	5.0*	2.6 (1.1, 9.7)
Non-dusty	36.6	5.0	13.3		1
Smoking					
Heavy smokers	22.6	56.6	44.4	11.5*	12.4 (1.7, 19.5)
Others	74.6	43.4	55.6		1
Duration of service					
>10 years	62.0	72.0	36.2	5.3*	2.8 (1.08, 5.8)
<10 years	38.0	28.0	63.8		1
Body mass index					
>25	17.5	19.0	5.8	1.6	1.3 (0.7, 3.2)
<25	82.5	91.0	94.2		1
Fuel used for cooking					
Wood and kerosene	49.8	66.0	53.9	1.7	0.5 (0.5, 2.8)
Gas	50.2	44.0	46.1		1
Overcrowding					
Present	73.8	60.7	65.1	0.6	0.9 (0.5, 2.3)
Absent	26.2	39.3	34.9		1

*p<0.05.

sciences (SPSS) version 13.0. Chi-square and odds ratios (ORs) with 95% confidence intervals (CI) were calculated for univariate analysis. Subsequently, the significant factors on univariate analysis were entered into a logistic regression model and the adjusted ORs with 95% CI obtained. Independent sample t-test was used for the analysis of pulmonary function tests.

RESULTS

The study population consisted of 95 TW out of 243 suffering from respiratory problems and 235 controls or NTW. The socioeconomic status of all the workers was similar. Univariate analysis of the risk factors for respiratory problems showed that dusty worksites such as the spinning, scouring and weaving sections, heavy smoking and duration of service >10 years (Table 2) were significant. Body mass index (BMI), fuels used for cooking and overcrowding were not found to be statistically significant.

A logistic regression analysis (backward step-wise) showed that dusty worksites such as the spinning, carding and weaving sections, heavy smoking and duration of service >10 years were independent significant risk factors. Workers in the scouring sections had 11.0 times (95% CI: 1.9, 19.6), spinning sections had 4.7 times (95% CI: 1.9, 19.6) and those in the weaving section had 2.6 times (95% CI: 1.1, 3.6) higher risk of developing respiratory problems compared with those

Table 3. Analysis of pulmonary function test among textile workers and non textile workers.

Test	Mean	p value*
Forced vital capacity (FVC) (lit.)		
Cases (TW)	2.61	1.9*
Controls(NTW)	3.01	
Forced expiratory volume in one second (FEV 1.0) (lit.)		
Cases (TW)	2.01	1.8*
Controls(NTW)	2.47	
FEV 1.0/FVC (%)		
Cases (TW)	85.5	0.6
Controls(NTW)	84.4	

* Independent sample t-test $p < 0.05$ considered significant.

working in the non-dusty sections. Workers with a smoking index of >20 pack-years (heavy smokers) had a 12.4 times (95% CI: 1.7, 19.5) higher risk for respiratory problems. Also, workers with a duration of service >10 years had a 3-fold (95% CI: 1.1, 5.6) higher risk compared with those with <10 years of service. Analysis of pulmonary function tests showed that there was a marginal but statistically insignificant difference in all the para-meters between the cases and controls (Table 3).

DISCUSSION

Though cotton dust has been established as the causative agent for respiratory problems, it is important to determine the other risk factors associated with the occurrence of the disease so as to implement comprehensive preventive measures. Present paper used the WHO definition of respiratory problems and excluded all those who had chronic bronchitis. Kamath et al. (1981) have reported that chronic bronchitis is a separate entity among cotton textile mill workers. Gupta (1969) in a review of respiratory problems found that many studies did not exclude patients with chronic bronchitis and this might affect the results.

In the past decade, studies from Turkey and China have shown that dust levels above the recommended values are associated with a high prevalence of respiratory problems (Altin et al., 2002; Christiani et al., 2001). The risk factors identified in our study such as working in the scouring, spinning and weaving sections, long exposure and heavy smoking have been reported by others as well. A study from France showed an OR of 7.3 for an exposure of 20 years compared to an OR of 2.8 for an exposure of 10 years in our study, as the period of exposure had direct relation with respiratory problems. Similarly, they had an OR of 3.7 for the dustiest sections compared with 11.0, 4.7 and 2.1 found in our study for the scouring, spinning and weaving sections, respectively, this indicate that scouring was the dustiest section of the textile industry. The French study did not find any association with smoking though our study did (Massin et al., 1991). A study from Lancashire, UK reported that the prevalence of respiratory problems like byssinotic symptoms was significantly related to years worked in the cotton industry, exposure to dust, quality of cotton used, work area, ethnic origin and smoking habits (Cinkotai et al., 1988). However, another study from Lancashire showed that byssinosis was rare among workers engaged in cotton weaving (Raza et al., 1999). In a study from Kanpur, only dustiness and length of exposure were important contributory factors to the occurrence of respiratory problems. The risk of respiratory problems among workers in the card room, blow room and waste plant sections and those who had an exposure of >5 years was nearly 3 times higher compared to workers in other sections of the mill and or those with <5 years of exposure (Mathur et al., 1993). Besides the aforementioned studies, there are also descriptive and comparative studies, in which some attempt has been made to identify the risk factors. In a study from Kishangarh, India it was reported that a majority of workers had developed the disease after 16 years of exposure, unlike in our study where the risk was high among those with 10 years of exposure, this clearly indicate that TW working in Varanasi, Uttar Pradesh Textile industry were more hazardous than Kishangarh. The disease was more common among smokers and severe among those who were consuming 15 pack-years of cigarette/bidis, (Barjatiya et al., 1990) comparable with our results because cigarette/bidis smoking were also affecting the respiratory problems.

This variation of results may be due to varying definitions of the disease. In another study from Mumbai, it is reported that the incidence of byssinosis was 30% among workers in dusty departments such as spinning, winding and weaving, compared with 17% in those working in the less dusty sections. Similarly, our observation of exposure of 10 years (OR=2.8) as a risk factor is comparable with the finding of the Mumbai study in which 45% of the workers who had >20 years of service had respiratory problems compared with 24% among those who had <10 years of service (Murlidhar et al., 1995).

Pulmonary functions showed a decline in the workers having respiratory problems, but it was not statistically significant. Other studies have reported either an insignificant decline in pulmonary functions or a decline independent of the symptoms of respiratory problems. A study from California analysed the acute effect of cotton gin environment on lung functions and found no correlation between the symptoms of respiratory problems and objective decrease in FEV 1.0 (Larson et.al., 1981). The same researchers conducted a prospective, longitudinal study over a period of 4 years and reported an insignificant decline of forced expiratory flow (FEV 1.0, FEV 1.0 /FVC and FEF) 25–75%. They failed to find any detrimental effect of the cotton gin environment on the rate of decline and reported the decline to be independent of the symptoms of respiratory problems (Larson and Barman, 1989).

In a study from France, only peak expiratory flow was taken into consideration and the absence of a constant link between Monday tightness and drop of peak expiratory flow was reported (Massin et al., 1991). In textile industries in north Portugal, workers exposed to cotton fibers in spinning areas had the highest prevalence of symptoms and reduction of the FEV 1.0. There were no cases of respiratory problems among workers in the weaving areas. Smoking habits were related to a reduction in FEV 1.0 and severity of respiratory illness but not to the presence of byssinosis (DaCosta et al., 1998). A 15-year longitudinal study from Shanghai, China reported that cotton workers had small, but significantly greater, adjusted annual declines in FEV1.0 and FVC than did silk workers. Years worked in cotton mills, high level of exposure to endotoxins, and across-shift drops in FEV 1.0 were found to be significant determinants of a longitudinal change in FEV 1.0, after controlling for appropriate confounders. Moreover, there were statistically significant associations between excessive decrease in FEV 1.0 and respiratory problems, chest tightness at work and chronic bronchitis in cotton workers.

It appears that longitudinal studies of 10–15 years' duration may be required to study the effect of respiratory problems on lung functions (Christiani et al., 2001). The results of our study confirm the findings of some previous studies. Similar respiratory problems were also found in the case of male TW working in scouring and spinning section of the textile industry.

Suggestions

There is a need for textile mills to reduce the dust levels in the scouring, spinning and weaving sections. Workers should be encouraged to use protective measures such as face-masks. Since heavy smoking is a risk factor for respiratory problems, measures should be taken to reduce smoking among textile workers. Rotating workers from dusty to non-dusty sections on a regular basis might reduce the length of exposure to higher dust levels, thereby reducing the risk.

A comprehensive workers health policy should be developed including preventive, promotive and curative measures to address the health and nutritional needs of textile workers' population.

Specific strategy should be developed for improving nutritional status. Welfare measures by textile industrial authorities should be strengthened for better sanitary measures and safe drinking water, better housing, adequate food supply, medical care and for overall improvement of socio-economic conditions. Periodic health check up is also advisable to monitor health and nutrition.

ACKNOWLEDGEMENTS

Author is thankful to textile workers, their families and factory owners for their cooperation. I am especially grateful for the assistance and encouragement of my supervisor Prof. A.K. Kapoor and co-supervisor Prof. Satwanti Kapoor of Department of Anthropology, University of Delhi, India and the medical professional of Banaras Hindu University, Varanasi, Uttar Pradesh, India for their help during research. Author is also thankful to UGC for giving him financial assistance to carryout the present work.

REFERENCES

Altin R, Ozkurt S, Fisekci F, Cimrin AH, Zencir M, Sevinc C (2002). Prevalence of byssinosis and respiratory symptoms among cotton mill workers. Respiration. 69: 52-56.

Barjatiya MK, Mathur RN, Swaroop A (1990). Byssinosis in cotton textile workers of *Kishangarh*. Indian J. Chest Dis. Allied. Sci., 32: 215-223.

Berry G, McKerrow C, Molyneux M, Rossiter C, Tombleson J (1973). A study of the acute and chronic changes in ventilatory capacity of workers in *Lancashire* cotton mills. Br. J. Ind. Med., 30: 25-36.

Castellan R, Olenchock S, Hankinson J, Millner P, Cocke J, Bragg C (1984). Acute bronchoconstriction induced by cotton dust: dose-related responses to endotoxin and other dust factors. Ann.

Int. Med., 101: 157-63.
Castellan R, Olenchock S, Kinsley K, Hankinson J (1987). Inhaled endotoxin and decreased spirometric values. N. Engl. J. Med., 317: 605-10.
Christiani DC, Wang XR, Pan LD, Zhang HX, Sun BX, Dai H (2001). Longitudinal changes in pulmonary function and respiratory symptoms in cotton textile workers: a 15 year follow-up study. Am. J. Respir. Crit. Care Med., 163: 847–853.
Cinkotai FF, Rigby A, Pickering CA, Seaborn D, Faragher E (1988). Recent trends in the prevalence of byssinotic symptoms in the *Lancashire* textile industry. Br. J. Ind. Med., 45: 782-789.
DaCosta JT, Barros H, Macedo JA, Ribeiro H, Mayan O, Pinto AS (1998). Prevalence of respiratory diseases in the textile industry: relation with dust levels. Acta. Med. Port., 11: 301-309.
Datt R, Sundaram KPM (1998). Indian Economy. S. Chand, New Delhi, pp. 602.
Florey CV, Leeder SR (1982). Methods for cohort studies of chronic airflow limitation. Copenhagen, World Health Organization.
Gupta MN (1969). Review of byssinosis in India. Indian J. Med. Res., 57: 1776-1789.
Jaiswal A (2004). Respiratory efficiency as affected by exposure to textile dust: health status evaluation of textile workers of district *Varanasi*, *Utter Pradesh*. Gene. Environment and Health. pp. 135-162.
Kamath SR, Kamath GR, Salpekar VY, Lobo E (1981). Distinguishing byssinosis from chronic obstructive pulmonary disease: results of a prospective five-year study of cotton mill workers in India. Am. Rev. Respir. Dis., 124: 31-40.
Kennedy S, Christiani D, Eisen E, Wegman D, Greaves I, Olenchock S (1987). Cotton dust and endotoxin exposure-response relationships in cotton textile workers. Am. Rev. Respir. Dis., 135: 194-200.
Larson RK, Barman ML, Smith DW, Nicol L (1981). Study of respiratory effect of short and long term cotton gin exposure. Chest, 79: 228-258.
Larson RK, Barman ML (1989). A longitudinal study of pulmonary function in cotton gin workers in the *San Joaquin Valley*. Chest, 96: 819-823.
Massin N, Moulin JJ, Wild P, Meyer-Bisch C, Mur JM (1991).A study of the prevalence of acute respiratory disorders among workers in the textile industry. Int. Arch. Occup. Environ. Health, 62: 555-560.
Mathur N, Gupta BN, Rastogi SK (1993). Multivariate analysis of byssinosis risk assessment. Indian J. Chest Dis. Allied Sci., 35: 185-190.
Murlidhar V, Murlidhar VJ, Kanhere V (1995). Byssinosis in a *Bombay* textile mill. Natl. Med. J. India, 8: 204-207.
Raza SN, Fletcher AM, Pickering CA, Niven RM, Faragher EB (1999). Respiratory symptoms in *Lancashire* textile workers. Occup. Environ. Med., 56: 514-19.
Roach S, Schilling RA (1960). Clinical and environmental study of byssinosis in the *Lancashire* cotton industry. Br. J. Ind. Med. 7: 1-9.
Schilling RSF (1956). Byssinosis in cotton and other textile workers. Lancet, 2: 261-265.
Schilling RSF (1962). Worldwide Byssinosis. BMJ., 11: 781-2.
Vilanilam JV (1980). A Historical and Socioeconomic Analysis of Occupational Safety and Health in India. Int. J. Health Serv., 10: 233-249.
Wang XR, Eisen EA, Zhang HX, Sun BX, Dai HL, Pan LD, Wegman DH, Olenchock SA, Christiani DC (2003). Respiratory symptoms and cotton dust exposure: results of 15 year follow up observation. Occup. and Environ. Med., 60: 935-941.
Weiner JS, Lourie JA (1981). Human Biology: A Guide to Field Methods. International Bio.Prog., IBP No 9, Marylebone London NW.