Anthropological and Physiological Study of Carpet and Silk Industrial Workers of Utter Pradesh, India.

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ABSTRACT

Occupational health in India is undoubtedly an issue that calls for more research by experts and activists. Respiratory problem is one of the major health threats to Carpet and Silk Industrial Workers , till now the studies are mostly clinically based. A lacuna in anthropological perspective is observed. In the present study an attempt has been made to study the anthropo-physiological among Carpet and Silk Industrial Workers of District Varanasi, Utter Pradesh. The study has been conducted to assess changes in lung functions and airway reactivity resulting from exposure to textile dust.
The subjects comprises of control group (non-workers) and test group (workers) of the same ecological condition (Industrial environment). Effect of dust was seen on anthropological and physiological variables Effect of dust was categorized based on the duration of exposure to dust, concentration of dust, socio economic factors and life styles. The 300 workers of three different sectors (cotton, wool/synthetic, silk) of the textile industry who worked in a textile unit containing 8 sub working sectors. The pattern of disease incidence in different production center of the textile industry is grossly dissimilar. As the result suggest that exposure to textile dust is responsible for acute and consistent decrease in lung function as well as a slight increase in airway reactivity.

INTRODUCTION

Occupational hazards are often encountered in industry, agriculture, mining and other working environments. The major categories of environmental stress for the worker are chemical agents; physical agents and conditions; biological agents and conditions; and psychosocial factors. These may act either singly or in combination. Occupational accidents result from the joint action of both environmental and human factors, and are therefore dealt with separately.

The interaction between man and his working environment may lead to betterment of health, when work is fully adapted to human needs and factors, or to ill health, if work stresses are beyond human tolerance. Occupational diseases and injuries result from specific exposures at work. In addition, work exposures may aggravate certain illnesses or be a factor of varying importance in causing diseases of multiple etiologies.

India is the fourth major country consuming textile raw material after China, Russia and USA, according to International Advisory Cotton Committee (1977) Industrialization is necessary for prosperity and at times for the survival of a Nation. The production is the real wealth of a Nation. Only industrialization is not enough, real

benefit is brought by continuous top performance of the worker which is only possible by their good health.

Industrial workers constitute only a segment of general population and the factors that influence the health of the population also apply equally to industrial workers i.e. water supply, sewage and waste disposal, nutrition and education, and the conditions prevailing in their place of work.

Occupational environment is the sum of external condition and influences which prevail at the place of work and which have a bearing on the health of the working population. The industrial workers today are placed in a highly complicated environment which is getting more complicated as man is becoming more ingenious. The textile industry in India contributes to the national economy in several ways and provides employment to the rural, poor and the economically backward sections of the society. It is not a commodity. It is a piece of art. In the changed industrial scenario, an emphatic world wide endeavor is visible in improving quality in all functions of an organization. Recognizing that the workplace safety and health is a decisive factor in an organizational effectiveness, several management frameworks have been proposed to implement cost effective occupational health and safety in preventing workplace ailments and promoting health and welfare of workers revolving around the International Standards Organization families of management standards. This is a very complex and highly problematic subject. There are many questions posed and few thoroughly researched answers provided in this paper which explores occupational health. The main aim of the of the study is to float a research agenda and possible areas of enquiry has been conducted to assess changes in lung functions and airway reactivity resulting from exposure to textile dust & the role of other indirect factors in relation to these changes.

Dusts are solid particles generated by handling, weaving, cutting, Polishing & washing organic and inorganic materials, such as cotton, fibre, humb, silk and jute. The exposure of man to dusts can lead to a wide variety of respiratory diseases, including pulmonary fibrosis, obstructive lung disease, allergy and lung cancer. Toxic dusts may produce systemic poisoning after inhalation, or act as skin irritants to produce dermatomes, allergic reactions and cancer.

Textile dust is a mixture of organic and inorganic elements in fibrous form. It appears as dust in the form of fine fibres in the air. Occupational exposure occurs in Textile industry and wherever Textile products are used, for instance, in handling cotton/silk/wool used in the textile industry. Exposure may also occur in the textile industry in the manufacture of carpet, sarres, thread and clothes.

Textile dust enters the body by inhalation, and fine dust, containing fibres may be deposited in the alveoli. The fibres are insoluble. The dust deposited in the lungs causes fibrosis, pleural plaques, bronchitis and lung cancer. Textile dust results in

impaired lung function after long period of exposure. The symptoms are shortness of breath, chest pain, and later bronchitis with increased sputum.

Textile industry is one of the major growth industries for export purpose and which require large number of workers. Respiratory problem is one of the major health threats to Carpet and Silk Industrial Workers . It leads to some systemic symptoms in exposed workers, along with this they suffer from number of other physical problem like hearing loss or noise problem. (Shake, 1996; Chavalitsakulchai, et al, 1989), low back pain (supplementary report, Industrial health 35, 1997); Respiratory symptoms and pulmonary function. (Ming yih et al, 2003); Bysonosis diseases (Shamssain and Shamsian, 1996; Zuskin, et al, 1990; Kogali, Mustafa, 1995) colourvision dysfunction in long term solvent (Dye) exposure,(Ihrig, et al, 2002).

In the present paper an attempt has been mademade to study the anthropo-physiological among Carpet and Silk Industrial Workers of District Varanasi, Utter Pradesh. The study has been conducted to assess changes in lung functions and airway reactivity resulting from exposure to textile dust.

METHODOLOGY

The textile mill selected for study have all departments with broad sections, using both coarse and synthetic yarns after preparation; the research schedules were standardized on a set of 25 subjects, interviewed and measured on two consecutive days. After the test-retest study, minor modifications were made in the proforma and a study was conducted from June to October 2006 in Varanasi. A total no. of 300 Textile Workers (cotton, wool/synthetic, silk) from 17 different factories were interviewed and measured, this group has been treated as test group. 300 persons residing in the same area but not working in the Textile Industries were taken as Non Textile Workers and have been referred to as control group. The Workers whose duration of work and exposure was more than 3 months were matched for age, sex and socio economic status. Up till now most of the studies were conducted on a clinical health dimensions mainly by the medical professional and we feel there is a need for population based cause effect study focusing anthropological dimensions.

Preliminary visits were made in different factories for motivation of factory owners and workers, for obtaining their full cooperation for administrative reason for this study. During these visits, the purpose of the survey was explained to the owner and the workers. The workers of the factory were registered and then the workers were examined. The worker out of station and in night shift could not be examined and were not included in the study

METHODS

1. Socio-cultural – exhaustive personal information on Occupational status, Socio-economic status, Health status with case studies etc.

2. Biological: Morphological and Physiological Variables.

The following physiological and body measurements were taken on each subject:

1. Stature
2. Body weight
3. Forced expiratory volume in first second (FEV_1),
4. Forced vital capacity (FVC),
5. Forced expiratory ratio (FER),
6. Peak expiratory flow rate (PEFR),

RESULTS AND DISCUSSION

It has been observed from the Table 1 that 33.33% Carpet and Silk Industrial Workers each in various age groups i.e. 20-29, 30-39, 40-49. Mean age of Carpet and Silk Industrial Workers were found to be 32.62±10.79 years. Similar 29.00±10.49 of non Carpet and Silk Industrial Workers

In Table 2, it has been observed that the cough was the most common symptoms in both the groups but was significantly more among Carpet and Silk Industrial Workers (53.66%) as compared to non Carpet and Silk Industrial Workers (9.33%).Next common symptom was chest pain and this too was more common among Carpet and Silk Industrial Workers (32.66% Vs 8.33%) Breathlessness (11% Vs 3.66%) along with fever (28.66% Vs 2.00%) was also more common among Carpet and Silk Industrial Workers .

Table 3 reflects the maximum mean value of stature (159.3 cm) in case of female Carpet and Silk Industrial Workers was found in age group 30-39 years and the minimum mean value (151.9 cm) in age group 20-29 years. In the case of female non Carpet and Silk Industrial Workers the maximum mean value (159.8) and minimum (152.4 cm) was found in age group 40-49 years and 20-29years respectively. The maximum mean value of stature (169.8 cm) in case of male Carpet and Silk Industrial Workers was found in age group, 20-29 years and the minimum (165.7 cm) in age group of 40-49. In the case of male non Carpet and Silk Industrial Workers the maximum (165.3 cm) and minimum mean value (161.3 cm) was found in age group, 20-29years and 40-49years respectively. Statistically significant difference was observed between female Carpet and Silk Industrial Workers and female non Carpet and Silk Industrial Workers in the age group, 30-39years ($p<0.05$).

Table 4 depicts that the maximum mean value of body weight (50.6kg) in case of female Carpet and Silk Industrial Workers was found in age group 30-39 years and the minimum mean value of body weight (49.2kg) was found in age group, 20-29 years .In the case of female non Carpet and Silk Industrial Workers the maximum (57.5kg) and minimum mean value (54.7kg) was found in age group 40-49years and 30-39years respectively.

The maximum mean value of body weight (59.9kg) was found in case of male Carpet and Silk Industrial Workers in age group, 20-29 years and the minimum mean value (47.5kg) was found in age group 30-39years, but in the case of male non Carpet and Silk Industrial Workers the maximum (62.3kg) and minimum mean value (53.9kg) was found in age group, 20-29 years and 30-39years respectively.

Statistically significant difference was observed between male Carpet and Silk Industrial Workers and non Carpet and Silk Industrial Workers in the age group, 30-39years ($p<0.05$).

Table 5 depict the maximum mean value of forced expiratory volume$_{1.0}$ (1.1 lit.) in case of female Carpet and Silk Industrial Workers was found in age group 30-39 years and the minimum mean value (0.8) in age groups 20-29 and 40-49years . In the case of female non Carpet and Silk Industrial Workers the maximum mean value (1.2 lit.) and minimum mean value (0.7 lit.) was found in age group 40-49years and 30-39 years respectively.

The maximum mean value of forced expiratory volume$_{1.0}$ (1.7 lit.) in case of male Carpet and Silk Industrial Workers in age group 30-39 and the minimum mean value (0.8 lit) was found in age group of 40-49years. In the case of male non Carpet and Silk Industrial Workers the maximum mean value (2.0 lit.) was found in age group, 20-29years and minimum mean value (1.1) was found in age group 30-39years.

Statistically significant difference was observed between male Carpet and Silk Industrial Workers and non Carpet and Silk Industrial Workers in the age group, 39-39years ($p<0.05$).

Table 6 depict the maximum mean value of forced vital capacity (1.5lit.) in case of female Carpet and Silk Industrial Workers was found in age group 20-29 years and the minimum mean value (1.1lit.) in age group 40-49 years . In the case of female non Carpet and Silk Industrial Workers the maximum mean value (1.7 lit.) 20-29 years and minimum (1.2 lit.) was found in age group, 40-49 respectively.

The maximum mean value of forced vital capacity (1.1 lit.) in case of male Carpet and Silk Industrial Workers was found in age group 40-49years and the minimum mean value (0.81lit) was found in age group, 30-39 .In the case of male non Carpet and Silk Industrial Workers the maximum mean value (1.2 lit.) and minimum mean value (1.1 lit.) was found in age group of 30-39years and 20-29, 40-49, years respectively.

Table 7 reflects that the maximum mean value of forced expiratory ratio (87.3 %) in case of female Carpet and Silk Industrial Workers was found in age group 20-29 years and the minimum mean value (77.5 %) in age group of 40-49 years. In the case of female non Carpet and Silk Industrial Workers the maximum mean value (90.5%), 40-49 years and minimum mean value (64.0%) was found in age group of 30-39 years.

The maximum mean value of forced expiratory ratio (82.3%) in case of male Carpet and Silk Industrial Workers was found in age group 30-39years and the minimum mean value (75.6%) was found in age group of 40-49 years. In the case of male non Carpet and Silk Industrial Workers the maximum mean value (86.8%) and minimum mean value (75.7%) was found in age group of 30-39years and 20-29 years respectively. Statistically significant difference was observed between female Carpet and Silk Industrial Workers and non Carpet and Silk Industrial Workers in the age group, 20-29 years ($p<0.01$).

Table 8 illustrate that the maximum mean value of peak expiratory flow rate (158 l/min) in case of female Carpet and Silk Industrial Workers was found in age group 40-49 years and the minimum mean value (101.8 l/min) in age group 30-39 years. In the case of female non Carpet and Silk Industrial Workers the maximum (161.25 l/min) in 30-39 years and minimum mean value (87.0 l/min) was found in age group, 40-49.

The maximum mean value of peak expiratory flow rate (109.1 l/min) in case of male Carpet and Silk Industrial Workers was found in age group 30-39 years and the minimum mean value (87.5 l/min) in age group 40-49years .In the case of male non Carpet and Silk Industrial Workers the maximum mean value (211.12 l/min) and minimum mean value (61.25 l/min) was found in age group of 30-39years and 40-49years respectively. Significant difference was observed between female Carpet and Silk Industrial Workers and non Carpet and Silk Industrial Workers in the age group, 40-49 years ($p<0.01$).

Table 9 shows that the maximum number of workers 167 (55.67%) were of low socio-economic status i.e. having per capita income of 1000-1999 Rs/month. Non Carpet and Silk Industrial Workers group followed the same pattern as 156 (52.00%) persons in this group were also of low socio-economic status

Table 10 shows that the maximum number of workers 191 (63.67%) were belongs to joint family and 109(36.33%) were belongs to nuclear family. Non Carpet and Silk Industrial Workers group followed the same pattern as 164 (54.67%) persons in this group were also of joint family.

Table 11 shows that the maximum number of workers 184 (61.33%) were came from some other places therefore migratory in status where as 116 (38.67%) workers are an autochthon of the area. settler in status.

Table 1: Age wise distribution of Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers

Age (years)	Carpet and Silk Industrial Workers		Non Carpet and Silk Industrial Workers	
	No	%	No	%
20-29	100	33.33	100	33.33
30-39	100	33.33	100	33.33
40-49	100	33.33	100	33.33
Total	300	100.00	300	100.00
Mean age ± SD (in yrs	32.62±10.79		29.00±10.49	

Table 2: Distribution of Symptoms Among Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers

Chest Symptoms	Carpet and Silk Industrial Workers		Non Carpet and Silk Industrial Workers	
	No.	%	No.	%
Cough	161	53.66	28	9.33
Chest Pain	98	32.66	25	8.33
Fever	86	28.66	6	2.00
Breathlessness	33	11.00	13	4.33
Chest rightness	46	15.33	11	3.66
Others	76	25.33	7	2.33

Table 3: Comparison of Stature between Carpet and Silk Industrial Workers and NonCarpet and Silk Industrial Workers

Age Group	Female Carpet and Silk Industrial Workers			Female Non Carpet and Silk Industrial Workers			't'
	n	Mean (cm)	± SD	n	Mean(cm)	± SD	
20-29	50	151.9	8.9	50	152.4	3.49	0.91
30-39	50	159.3	4.31	50	154.5	9.34	2.68*
40-49	50	154.6	8.3	50	159.8	7.29	0.71

*p<0.05

Age Group	Male Carpet and Silk Industrial Workers			Male Non Carpet and Silk Industrial Workers			't'
	n	Mean (cm)	± SD	n	Mean(cm)	± SD	
20-29	50	169.8	7.9	50	165.3	5.95	0.36
30-39	50	168.2	5.26	50	164.4	7.51	1.66
40-49	50	165.7	8.55	50	161.3	6.87	1.13

Table 4: Comparison of Body weight between Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers

Age Group	Female Carpet and Silk Industrial Workers			Female Non Carpet and Silk Industrial Workers			't'
	n	Mean (kg)	± SD	n	Mean (kg)	± SD	
20-29	50	49.2	8.03	50	55.7	15.96	0.81
30-39	50	50.6	9.31	50	54.7	12.21	0.82
40-49	50	49.6	5.46	50	57.5	8.56	0.09

Age Group	Male Carpet and Silk Industrial Workers			Male Non Carpet and Silk Industrial Workers			't'
	n	Mean(kg)	± SD	n	Mean (kg)	± SD	
20-29	50	59.9	8.65	50	62.3	10.35	0.02
30-39	50	47.5	4.39	50	53.9	1.59	2.35*
40-49	50	57.1	10.1	50	60.2	7.73	0.21

* p<0.05

Table 5: comparison of Forced expiratory volume$_{1.0}$ between Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers

Age Group	Female Carpet and Silk Industrial Workers			Female Non Carpet and Silk Industrial Workers			't'
	n	Mean(l)	± SD	n	Mean(l)	± SD	
20-29	50	0.8	0.41	50	1.1	0.79	0.93
30-39	50	1.1	0.47	50	0.7	0.43	1.45
40-49	50	0.8	0.57	50	1.2	1.06	1.23

*p<0.05

Age -Group	Male Carpet and Silk Industrial Workers			Male Non Carpet and Silk Industrial Workers			't'
	n	Mean(l)	± SD	n	Mean(l)	± SD	
20-29	50	0.9	0.34	50	2	0.95	0.51
30-39	50	1.7	0.7	50	1.1	0.39	2.57*
40-49	50	0.8	0.52	50	1.9	3.62	0.93

Table 6: Comparison of Forced vital capacity between Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers

Age Group	Female Carpet and Silk Industrial Workers			Female Non Carpet and Silk Industrial Workers			't'
	n	Mean(l)	± SD	n	Mean(l)	± SD	
20-29	50	1.5	0.78	50	1.7	0.43	0.75
30-39	50	1.3	0.66	50	1.5	0.51	0.79
40-49	50	1.1	1.05	50	1.2	0.64	0.89

Age Group	Male Carpet and Silk Industrial Workers			Male Non Carpet and Silk Industrial Workers			't'
	n	Mean(l)	± SD	n	Mean(l)	± SD	
20-29	50	1.0	0.71	50	1.1	0.42	0.61
30-39	50	0.81	0.47	50	1.2	0.99	0.68
40-49	50	1.1	0.43	50	1.1	0.45	1.43

Table 7: Comparison of Forced expiratory ratio between Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers

Age Group	Female Carpet and Silk Industrial Workers			Female Non Carpet and Silk Industrial Workers			't'
	n	Mean (%)	± SD	n	Mean (%)	± SD	
20-29	50	87.3	16.17	50	90.5	13.85	2.6*
30-39	50	81.5	15.46	50	64.0	26.91	1.31
40-49	50	77.5	20.11	50	83.8	12.72	1.31

* p<0.05

Age Group	Male Carpet and Silk Industrial Workers			Male Non Carpet and Silk Industrial Workers			't'
	n	Mean (%)	± SD	n	Mean (%)	± SD	
20-29	50	75.7	19.99	50	80.2	32.95	1.02
30-39	50	82.3	8.94	50	86.8	12.07	0.46
40-49	50	75.6	20.95	50	78.6	20.59	0.33

Table 8: Comparison of Peak expiratory flow rate between Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers

Age Group	Female Carpet and Silk Industrial Workers			Female Non Carpet and Silk Industrial Workers			't'
	n	Mean (l/min)	± SD	n	Mean (l/min)	± SD	
20-29	50	107.2	49.03	50	120.87	82.63	1.35
30-39	50	101.8	56.23	50	161.25	65.32	0.65
40-49	50	158.0	99.74	50	87.0	35.77	2.24*

*p<0.05

Age -Group	Male Carpet and Silk Industrial Workers			Male Non Carpet and Silk Industrial Workers			't'
	n	Mean (l/min)	± SD	n	Mean(l/min)	± SD	
20-29	50	89.5	24.13	50	61.25	26.65	1.48
30-39	50	109.1	27.62	50	211.12	63.24	0.31
40-49	50	87.5	41.89	50	79.0	41.89	1.42

Table 9: Distribution of Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers according to socio-economic status

Per capita income (Rs /month)	Carpet and Silk Industrial Workers		Non Carpet and Silk Industrial Workers	
	No.	%	No.	%
1000-1999	167	55.67	156	52.00
2000-2999	78	26.00	85	28.33
3000-4999	32	10.67	29	9.67
5000 and above	23	7.67	30	10.00
Total	300	100.00	300	100.00

Table 10: Distribution of Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers according to family type

Family Type	Carpet and Silk Industrial Workers		Non Carpet and Silk Industrial Workers	
	no.	%	no.	%
Nuclear	109	36.33	136	45.33
Joint	191	63.67	164	54.67
Total	300	100.00	300	100.00

Table 11: Distribution of Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers according to Migration status

Migration status	Carpet and Silk Industrial Workers		Non Carpet and Silk Industrial Workers	
	no.	%	no.	%
Autochthon	116	38.67	224	74.67
Migratory	184	61.33	76	25.33
Total	300	100.00	300	100.00

Table 12: Comparison of Respiratory Functions of Carpet and Silk Industrial Workers from other Indian Studies.

Place of study	No. of workers studied	Respiratory problem		Variable used	Name of person/Year
		No.	%		
Delhi	1064	60	5.6	FVC,$FEV_{1.0}$,PEFR	Alhuwalia (1980)
Delhi	950	80	8.4	FVC,$FEV_{1.0}$,PEFR	Alhuwalia (1982)
Ahmedabad	253	16	6.3	FVC,$FEV_{1.0}$,PEFR	Gupta (1963)
Bombay	899	105	11.6	FVC,$FEV_{1.0}$,PEFR	Raghavan (1964)
Pune	105	15	14.3	FVC,$FEV_{1.0}$,PEFR	Thaker (1967)
Bombay	485	37	7.6	FEV1$FEV_{1.0}$,PEFR	Nagender (1967)
Lucknow	559	18	3.2	FVC,$FEV_{1.0}$,PEFR	Mehorotra (1966)
Varanasi	600(300 Workers and 300 Non Workers	98	32.66	Socio-cultural information, Anthropometric, Physiological variables.	Present Study (2006)

DISCUSSION

Respiratory problem is an occupational hazard for workers exposed to textile dust. Severity of disease varying from degree of exposure, concentration of dust socio-economic factor and life style. The present study reveals more incidences of respiratory problem which is quite high in comparison to other Indian studies (Barjatiya et.al, 1990) Similarly Kurilora (1977) found the higher prevalence of chest symptom and short respiratory illness among wool Textile Workers and specially more among Textile Worker at dusty vocation. but low when compared with British studies (Schilling, 1962).

The high prevalence of the disease appears to be due to poor working conditions. The work rooms were poorly ventilated. Thus, textile fibres float freely in the work environments, exposing the workers continuously to inhale them. Furthermore, only few of the workers used any protective face masks, many of them were doing continuously two shift duties due to poverty. Smoking habit of the workers made things worse. The low incidence reported from elsewhere in India may be due to better working conditions. It may be noted that the blow and card rooms as well as the spinning section showed equal prevalence of the disease, because workers got transferred to less dusty spinning section only after they had become symptomatic. It was observed that the Carpet and Silk Industrial Workers and Non Carpet and Silk Industrial Workers , both males and females did not differ significantly with respect to height, weight, indicating that the exposure to textile dust has not affected the body morphology. As far as the symptoms among Carpet and Silk Industrial Workers and non Carpet and Silk Industrial Workers are concerned cough was most common in both the groups but was higher in textile

group (43.21%), followed by chest pain and breathlessness (22.84%) i.e. pulmonary defect. Gupta (1963) also found similar results i.e. higher prevalence of cough (54.32%) and pulmonary defects (38.25%) among workers in Textile Industry.

This disabling occupational respiratory disease can be prevented by taking suitable measures to reduce the dust concentration in the working area, providing protective face masks, by disallowing overtime working and most important discouraging smoking and transferring them to less dusty area on becoming symptomatic. Periodic health checks are equally important.

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