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Original Research Article

Prevalence of Respiratory Symptoms and Demographic Profile of Chronic Obstructive Pulmonary Disease among Workers Engaged in Wool Industries of Bikaner

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ABSTRACT

Introduction: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality worldwide. Today it is the 12th most prevalent disease and 5th leading cause of death in the world which by 2020 is projected to be acquiring 5th and 3rd rank respectively.

Material & Methods: The present study was conducted under the Respiratory Division, Department of Medicine, S.P. Medical College and associated group of P.B.M. Hospitals, Bikaner to find out prevalence of COPD amongst wool workers engaged in woolen industry of Bikaner district. In total 2340 workers in 33 randomly selected units were screened. To all initially approached 2340 workers a general health questionnaire and a modified questionnaire of various respiratory symptoms regarding COPD were distributed to avoid discrimination among workers.

Results: Mean age of total workers screened (2340)- 31.82 (range 18 to 70), Total Subjects (964) - 41.12 (range 30 to 70), Total 'suspected COPD' (708)- 41.91 (range 30 to 70), Mean age of Subjects – 42.15 (range 30-70), Male: Female ratio of the subjects 4.11:1 Smoking habit- Non-smoker: smoker = 1.77:1 Suspected Cases - COPD according to modified IAPG' (n=708) and COPD Original IAPG cases (n=236), Diagnosed Cases (By GOLD Criteria) - Total COPD modified cases (n=60) and Total COPD original IPAG case (n=54).

Conclusion: While studying prevalence of COPD among woolworkers of Bikaner, in the study Most of the female subjects (126 out of 189) were suggested in sorting vocation of wool industry (maximum exposure to raw wool). So we can conclude that exposure to the wool have definite relevance in etiopathogenesis of COPD. Prevalence (8.46%) among female workers in this is evaluated to be significantly higher than reported by others among general population in India. It needs further evaluation.

Keywords: Chronic Obstructive Pulmonary Disease, Wool Industries, Morbidity, Mortality, Etiopathogenesis.

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INTRODUCTION

With rapid industrialization, urbanization and increasing smoking habits especially in developing countries, prevalence of COPD is increasing. Today it is the 12th most prevalent disease and 5th leading cause of death in the world which by 2020 is projected to be acquiring 5th and 3rd rank respectively.[1] COPD incorporates chronic bronchitis, emphysema and small airway disease. In 2001, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) issued and now updates yearly guidelines[2] that aim to improve prevention and management of COPD through a concerted worldwide effort and to encourage renewed research interest in this highly prevalent disease. It is more common in males. Till date majority of the studies reported are from the developed world.

In India available data suggest a variable prevalence of COPD. The prevalence rates in males vary from 2.12 to 9.4% and in females from 1.33% to 9.4%.[3] Risk factors for COPD include both host factors and environmental exposures, and the disease usually arises from an interaction between these two types of factors. The host factor that is best documented is a rare hereditary deficiency of alpha-1 antitrypsin.[4,5] Other genes involved in the pathogenesis of COPD have not yet been identified. The major environmental factors are tobacco smoke; heavy exposure to occupational dusts and chemicals and indoor/outdoor air pollution.[2] In developing countries, biomass fuels such as dried dung, wood and crop residue used for cooking

and heating especially in villages, semi urban and slum areas is an important cause of pollution of indoor air. It is responsible for large number of COPD in rural habitants in general and women in particular.[6,7] Sheep wool is widely used in carpet, hosiery and textile industries all around the world. As such wool, wool dust or wool related industrial environment has not been widely documented as etiological factor for COPD but there are definite studies suggesting increased respiratory symptoms among wool workers working in some of the vocations like sorting, opening, carding, spinning, of wool industries.[8] Bikaner is known on world map for its wool industries which is largest in Asia and 3rd among the world's wool industries in different countries.[9] Approximately more than 10,000 workers are engaged in the organized sector of wool industries of Bikaner. Out of the total wool production for carpet in India, about 45% comes from Bikaner.[9]

MATERIALS AND METHODS

The present study was conducted under the Respiratory Division, Department of Medicine, S.P. Medical College and associated group of P.B.M. Hospitals, Bikaner to find out prevalence of COPD amongst wool workers engaged in woolen industry of Bikaner district. As per Wool Ways[9] (A quarterly information booklet about wool and woolen industries) there are about 235 large and small functioning units dealing with raw wool present in the organized sector of woolen industry of Bikaner. The study was planned to cover about 20% of these workers. Randomization was made from the alphabetical list of woolen mills. We approached to owner of the respective unit one by one for conducting study depending on the convenience and consent of owner, workers and investigating team.

In total 2340 workers in 33 randomly selected units were screened. To conduct the study candidate was assisted by a team of four well oriented volunteers (not related to medical profession). Volunteers were explained in detail about all modalities for conduction for study.

Inclusion Criteria

- All workers of age above 30 years working in woolen industries.

Exclusion Criteria

- Workers with exposure to other occupational risk factors in the past,
- Major surgery in previous three months,
- Pregnant female workers,
- Patients already diagnosed to be having respiratory disease prior to joining this work,
- Diagnosed or treated case of pulmonary tuberculosis,
- Chest deformities like scoliosis, kyphosis and other.

To all initially approached 2340 workers a general health questionnaire and a modified questionnaire of various respiratory symptoms regarding COPD (Translated in Hindi Language) were distributed to avoid discrimination among workers. The questionnaire of respiratory symptoms of COPD was based on the International Primary Airways Group questionnaire for COPD (IPAG). Completely filled general health questionnaire and modified IPAG questionnaire were analyzed by candidate and 964 workers were sorted for the study after applying inclusion and exclusion criteria to assess ventilatory pulmonary function test in them. Out of 2340 workers approached 1376(58.8%) workers were excluded for not fulfilling pre decided exclusion criteria.

Table 1: Demographic profile of the total subjects (n=964)

Characteristics	Mean	SD
Age (yrs)	41.12	8.67
Height (cms)	163.14	10.38
Weight (kg)	55.72	11.72
BMI (kg/m²)	20.86	3.51
Male : Female	4.11:1	
Non Smoker : Smoker	1.77:1	
Age group (yrs)	No.	%
30-40	576	59.76
41-50	281	29.15
>50	107	11.09
Total	964	100.00
	Mean Age (yrs)	**SD**
Male	40.64	8.53
Female	43.11	9.03

Table 2: Distribution of subjects according to duration of work (n=964)

Duration (yrs)	No.	%
1-9	501	51.97
10-19	281	29.15
20-29	142	14.73
>29	40	4.15
χ^2 (<10 yrs V/s >10yrs)	2.99	>0.05

OBSERVATIONS

Out of 2340 workers in 33 wool mills approached, 1376 were excluded. Remaining 964 (41.2%) were labeled as "subjects". Out of these 964 subjects, 256 (10.94%) subjects scored <17 points according to modified IPAG questionnaire.

Table 1 reviewed the demographic profile of total subjects (964). After studying demographic profile of total subjects evaluated by modified IPAG screening questionnaire, mean age was 41.12±8.67 years. There was no significant difference between males and females. Mean height of the study group was

163.14±10.38 cms, mean weight of the study group was 55.72±11.72kg and mean BMI of the study group was 20.86±3.51kg/m^2. Male to female ratio was 4.11:1, while non-smoker to smoker ratio was 1.77:1. Subjects were distributed in four sub groups according to duration of their work. 501 (51.97%) subjects had work duration of 1-9 years. The number of subjects with work duration between 10-19 years was 281(29.15%), similarly 142 (14.73%) subjects had a work duration of 20-29 years. 40 (4.15%) subjects had exposure to wool for more than 29 years (Table 2).

As evident from table 3 the majority of subjects in our study were male (80.39%), while 189 (19.61%) subjects were female. Maximum number of females out of 189 females workers were in the group of sorting (66.67%), maximum number of males out of 775 were in group of carding (12.77%). Table 4 shows prevalence of chronic respiratory symptoms in relation to age. Cough was found in 30.38%, 51.25% and 61.68% subjects in 30-40 years, 41-50 years and >50 years age group. Sputum was found in 18.92%, 36.65%, 52.34% subjects in the age group 30-40 years, 41-50 years and >50 years respectively. As far as wheeze concern it was found in 7.99%, 21.00% and 43.93% in the age groups 30-40, 41-50 and >50 years. Percentage of dyspnoea was highest among the subjects in the age group ≥ 50 (29.91%). When subjects of <40 years group were compared with ≥40 years group, it was observed that the respiratory symptoms were significantly increased.

Table 3: Distribution of Cases according to Vocation in relation to sex (n=964)

Vocation	Sex								Total Vocation Group	
	Female (n=189)		% (n=964)	Vocation Gp (%)	Male (n=775)		% (n=964)	Vocation Gp (%)		
	No.	%			No.	%			No.	%
Sorting (n=126)	126	66.67	13.07	100	0	-	-	-	126	13.07
Opening (n=96)	0	-	-	-	96	12.39	9.96	100	96	9.96
Carding (n=109)	10	5.29	1.04	9.17	99	12.77	10.27	90.83	109	11.31
Spinning (n=128)	35	18.52	3.63	27.34	93	12.00	9.65	72.66	128	13.28
Washing (n=90)	8	4.23	0.83	8.89	82	10.58	8.51	91.11	90	9.34
Packing (n=63)	0	-	-	-	63	8.13	6.54	100	63	6.54
Loading (n=91)	0	-	-	-	91	11.74	9.44	100	91	9.44
Mechanical (n=85)	0	-	-	-	85	10.97	8.82	100	85	8.82
Supervisor (n=73)	0	-	-	-	73	9.42	7.57	100	73	7.57
Official (n=103)	10	5.29	1.04	9.71	93	12.00	9.65	90.29	103	10.68
Total (n=964)	189	100.0	19.61		775	100.0	80.39		964	100.0

Table 4: Prevalence of respiratory symptoms according to age

Characteristics	Cough		Sputum		Wheeze		Allergic		Dyspnoea	
	No	%	No	%	No	%	No	%	No	%
Age group (yrs)										
30-40 (n=576)	175	30.38	109	18.92	46	7.99	45	7.81	7	1.22
41-50 (n=281)	144	51.25	103	36.65	59	21.00	8	2.85	16	5.69
>50 (n=107)	66	61.68	56	52.34	47	43.93	7	6.54	32	29.91
Total	385		268		152		60		55	
	χ^2	P	χ^2	P	χ^2	p	χ^2	P	χ^2	P
Age ≤40 Vs >40	22.8	<0.001	30.9	<0.001	46.3	<0.001	5.5	<0.05	46.9	<0.001

Table 5: Prevalence of respiratory symptoms according to sex

Characteristics	Cough		Sputum		Wheeze		Allergic		Dyspnoea	
	No	%	No	%	No	%	No	%	No	%
Sex										
Female (n=189)	67	35.45	49	25.93	26	13.76	10	5.29	9	4.76
Male (n=775)	318	41.03	219	28.26	126	16.26	50	6.45	46	5.94
Total	385		268		152		60		55	
	χ^2	P	χ^2	p	χ^2	P	χ^2	P	χ^2	p
F V/s M	0.86	>0.05	0.24	>0.05	0.53	>0.05	0.31	>0.05	0.34	>0.05

Table 5 shows prevalence of chronic respiratory symptoms in relation to sex. Cough was found in 41.03% male subjects and 35.45% female subjects. History of sputum production was present in 28.26% of male subjects 25.93% female subjects. As far as wheeze concern 13.76% females and 16.26% males responded positive. 5.29% females responded positive for the allergic manifestations while the prevalence of allergic manifestations among male subjects was 6.45%. Dyspnoea was present 4.76% of female population and 5.94% of male population in study group.

DISCUSSION

As such wool industry involves sheep breading to production of luxury carpet, hosiery and textile. Bikaner is biggest wool industry of Asia and third in world in handling raw wool and preparation of wool yarn used for production of wool products. It is estimated that there is approximately 250 tonnes per day raw wool is consumed in wool industries of Bikaner not only from the surrounding area but also from Australia, New Zealand and Urab Countries for the initial processing and yarn manufacturing (1.8-2 lac kg/day approximately).[11] There are about 235 small and large units of different capacity engaging about ten to twelve thousand number of workers (official as well as unofficial) approximately working in different vocations from sorting to loading and unloading. Other vocations are opening, carding, spinning, washing and packing. There are other workers who are not directly handling wool as such but working in the industry as an important part. They are grouped as mechanical staff, supervisors and official staff. Details about occupation, personnel history and symptoms related to chronic obstructive pulmonary diseases were taken from each individual. A detail physical examination and relevant investigation were done in the individuals with deranged VPF to rule out other illness which may affect pulmonary functions. In the wool industries the workers are engaged in different vocations according to their nature of work. These different vocations are sorting, opening, carding, spinning, washing, loading and packing. Workers were allotted different group in accordance with their nature of work. Out of various vocations being carried out by the wool workers in wool industries some vocations are almost free of wool fibres and dust while other are heavily loaded with the dust and wool fibres. Vocations like sorting opening, carding and the vocations where the workers are heavily exposed to wool fibres, fine particle of wool dust and silica dust. Other vocations like spinning, packing and loading are vocations in which there is less exposure to wool dust and fibres. The smoking habit was present in 348(36.1%) subjects all smoker subjects were male, while not a single female worker responded positive for the smoking. All the female workers in the present study were exposed to biomass fuel while working in kitchen. Most of them were using wood and dung in their kitchen as cooking fuel. Zuskin et al[10], Rastogi et al[11], Kumar et al[12], observed that those workers who are exposed to wool dust for >10 years or more had a higher prevalence of chronic respiratory symptoms than those exposed for <10 years. The mechanism of this can be that with increasing exposure to wool, the effect of wool produced on the bronchopulmonary mucosa go on increasing, producing respiratory symptoms in more number of subjects. Overall higher prevalence of pulmonary function derangement in present study as compared to Kumar et al[12] is because the subjects in present were more than 30 years of age while Kumar et al[12] studied wool workers irrespective of their age. Rastogi et al[11] carried out their study among the carpet workers where raw wool is not used but well sorted spinned and washed wool is used for making carpets. In the woolen industries of Bikaner; workers are dealing with raw wool so they are heavily exposed to wool dust and fibers.

CONCLUSION

While studying prevalence of COPD among woolworkers of Bikaner in the study; most of the female subjects (126 out of 189) were suggested in sorting vocation of wool industry (maximum exposure to raw wool). So we can conclude that exposure to the wool have definite relevance in etiopathogenesis of COPD. Prevalence (8.46%) among female workers in this is evaluated to be significantly higher than reported by others among general population in India. It needs further evaluation.

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