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Research article

A STUDY ON PULMONARY FUNCTION TESTS IN WEAVERS

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ABSTRACT

Occupation is the one in which person not only earn his daily bread but also spend one third of average adult life. As the number of industries is on the increase, several industries like cement industries, chemical industries, textile industries etc, serves mainly man for comfortable living. Health hazards caused due to a particular occupation is yet to gain importance in public health measures. These diseases are termed occupational hazards. Weavers are constantly exposed to fine cotton dust generated from the weaving unit. Inhalation of this dust compromises their lung function greatly. Occupational exposure to cotton dust has been a great threat to the respiratory function. Pulmonary function tests are set of parameters to assess the lung function. It measures the function of lung capacity and chest wall mechanics to determine a fault in lung function. **Materials & Method:** Spirometry is used to determine airway disorders and is capable of predicting early damage in lung function. This paper discusses about the lung impairment in female weavers of below age groups, corresponding to minimum 5 years of exposure to cotton dust. 50 non smoking female weavers of age groups 25-40 years are chosen respectively. Pulmonary function was assessed using computerized spirometry and compared with same age, healthy non weavers. **Conclusion**: The pulmonary function parameters such as FVC, FEV1, FEV1/FVC, and FEF25-75 were significantly reduced in weavers.

Key words: Pulmonary function tests, Spirometry, Occupational hazards, etc

INTRODUCTION

Weavers play an important role in a community. Weaving either its manual or mechanized has been important in a society which fulfill the clothing needs. Several studies have found that, on average, lung function is lower in cotton workers than in the general population and in general in those with a history of byssinosis. A mortality study reported in 1985 of women aged between 15 and 74 years found a marked excess in the proportional mortality ratio (PMR) from all causes of respiratory disease, including byssinosis, in textile workers, particularly in those employed as labourers and in fibre preparation, whose PMR was more than 200 (i.e. more than twice expected; a PMR of 100 is equivalent to no excess mortality). The Occupational Health Decennial Supplement published in 1995 reported a PMR for chronic bronchitis and emphysema in female textile workers of 119 and of byssinosis of 1140.

Prevalence of byssinosis was 10.5%, chronic cough 7.5%, chronic phlegm 12.9%, wheeze with shortness of breath 22.3%, shortness of breath (grade 2) 21%, chest tightness ever 33.3%; whereas, a low prevalence of asthma (4%) was identified in this population[1].

Karjalainen et al studied the impact of occupational factors in the inception of adult onset persistent asthma, and consequently the potential for prevention is much larger and more widely spread than generally assumed[2].DrAsaad Ahmed Nafees et al[3]studied the pattern and predictors for respiratory illnesses and symptoms and lung function among textile workers in Karachi, Pakistan. This was a cross-sectional survey of 372 adult male textile workers from the spinning and weaving sections of 15 textile mills from Karachi. Data were collected from November to December 2009 through a structured, pretested questionnaire and spirometry[3].

Christiani et al conducted their research in People's Republic of China. Pulmonary function tests were performed pre and post work shift on 887 textile workers with at least two years of employment in two cotton mills and one silk mill in Shanghai, the People's Republic of China. Environmental sampling was performed with vertical elutriators, and pulmonary function was performed with standardized techniques. Cotton textile workers were found to have greater across-shift decrements in forced expiratory volume in 1 s (FEV1.0) than silk workers. Increasing duration of exposure resulted in increasing acute decrements in FEV1.0, although significant acute decrements were found in workers with less than five years of exposure. The acute changes in FEV 1.0 were noted in both symptomatic and asymptomatic cotton workers, though the difference between the across-shift change in FEV1.0 (delta FEV1.0%) of the byssinotics and non byssinotics increased as work duration increased. There was no difference in pres hift FEV1.0 between the cotton and silk workers, but several selection factors likely influenced the observations[4].

Boskabady et al evaluated the respiratory and allergic symptoms in 66 Iranian carpet weavers and 66 controls with similar age and gender characteristics using a questionnaire including questions on work-related respiratory symptoms in the past year, allergies, smoking habits, and work exposure duration. A total of28 carpet weavers (42%) reported work-related respiratory symptoms. Incidences of all respiratory symptoms and most allergic symptoms were significantly higher in carpet weavers than in controls ($p<0.05$ - $p<0.001$). Moreover, most respiratory and allergic symptoms in carpet weavers were significantly more prominent during working hours ($p<0.01$ - $p<0.001$). Pulmonary function test results ofthe carpet weavers showed significant impairment compared with controls ($p<0.05$ - $p<0.001$)[5].

MATERIALS AND METHOD

Cotton weaving has been a major occupation of people in Thirupparkadal village in Vellore district over generations. Almost all the members of the family are involved in weaving. Cotton weaving causes excessive development of fine dust of cotton. Continuous exposure to this fine dust over years has caused a threat to their lung function. Reduction in lung function is directly proportional to years of exposure to cotton dust. This study mainly focuses on proving that over the years there is severe impairment in lung function.

Study population: Present study was conducted in weaving units at Thirupparkadal village in Vellore district, Tamilnadu in India. . Institutional Ethical committee of Meenakshi Medical College and Research Institute (MMCH&RI), Enathur Kanchipuram has given approval for the study. Study group consist of non smoking female weavers

Group I: female weavers aged 25- 40 yrs (n=50)

Group II: female non weavers aged25-40yrs (n=50). From all weavers informed consent was obtained and procedure of the research was properly explained. Subjects with clinical abnormalities of the neuromuscular diseases, known cases of gross anemia, diabetes mellitus, pulmonary tuberculosis, bronchial asthma, chronic bronchitis, bronchiectasis, emphysema and malignancy were excluded from the study. The subjects who had undergone abdominal or chest surgery were also excluded from the study.

Inclusion criteria: Non smoker, corresponding to minimum 5 years of exposure to cotton dust.

Exclusion criteria: Subjects with clinical abnormalities of the neuromuscular diseases,

known cases of gross anemia, diabetes mellitus, pulmonary tuberculosis, bronchial asthma, chronic bronchitis, bronchiectasis, emphysema and malignancy were excluded from the study. The subjects who had undergone abdominal or chest surgery were also excluded from the study.

Pulmonary function test: The pulmonary function tests was carried out using a computerized spirometer (Helios 401 RMS) using the standard laboratory methods. The spirometer was calibrated regularly and a brief physical and general examination was carried out and the anthropometric parameters (name, age, sex, height, weight, occupation, and smoker / nonsmoker) were entered in the computer. All the pulmonary function tests were done on the subjects comfortably in an upright position. During the test, the subject was adequately encouraged to perform their optimum level and also a nose clip was applied during the entire maneuver. Tests were repeated three times and the best matching results were considered for analysis. The parameters measured by the apparatus were the Forced vital capacity (FVC), Forced Expiratory Volume in 1st second (FEVI), FEVI /FVC, Forced Expiratory Flow in 25% - 75% (FEF25 -75%) with graphic curves were obtained.

Statistical analysis

The data of pulmonary function tests were presented as the Mean ± Standard Deviation for each of the parameter. The two groups were compared by using student t test by SPSS software. The values obtained are statistically significant.

RESULT AND DISCUSSION

Parameters	Group I	Group II(control group)	P Value
FVC	66.65 ± 4.793	83.26±2.5	< 0.01*
FEV 1	76.24 ± 5.180	86.25 ± 6.292	< 0.01*
FEV 1 / FVC	115.8 ± 2.600	87.9± 10.17	< 0.01*
FEF 25 - 75	40.88 ± 4.442	70.64 ± 2.019	< 0.01*

*significant

The mean values of pulmonary function parameters of weavers are given in above table. The table depicts the comparative decline in lung parameters of group I compared with group II. The FVC, FEV, FEF25-75, FEV1/FVC (as a percentage of predicted) was seen to significantly decreased in group I than group II. The Present study demonstrates that there is altered lung function in weavers due to chronic exposure. When compared to the predicted values there was statistically significant decline in the values of FVC, FEV, FEF25-75 and FEV1/FVC.

Inhalation of dust is an important cause of interstitial lung disease in India.[6] The present study demonstrates that there is a significant decrease in lung function as the years of exposure to cotton dust increases. The probable cause for the decrease in pulmonary function test is the accumulation in peri bronchial lymphoid and connective tissues along with varying degrees of wall thickening and remodeling in terminal and respiratory bronchioles arising from each pathway. Bronchiolar walls with marked thickening contained moderate to heavy amounts of carbon and mineral dust and wall thickening is associated with increase in collagen and interstitial inflammatory cells including dust-laden macrophages.[7] The study by Edwards et al has shown that in larger bronchi of the bysinotics there was a higher percentage of muscle and glands with corresponding lower percentage of connective tissues and cartilage. While in segmental bronchi no significant changes were observed.[12] Decrese in FVC, $FEV_1$and FEV1/FVC indicates an obstructive pattern of lung disease. Decrease in FEF indicates a pathology involving the larger airways due to cotton dust. Studies have shown that cotton dust induces histamine release or immunological reaction antigen-antibody reaction as mechanism of cotton dust disease. A growing number of literatures have confirmed that endotoxin is the main mediator in byssinosis and obstructive lung diseases.[13- 15.]

CONCLUSION

The data suggests that cotton dust inhalation can account for substantial decrease in lung function. In order to prevent these among weavers the strategies of use of mask, regular health check up and proper awareness about the symptoms of a particular lung dysfunction can be done

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