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Research Article

A STUDY TO ASSESS THE PEAK EXPIRATORY FLOW RATE IN NEPALESE POPULATION INVOLVED IN TAILORING OCCUPATION

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ABSTRACT
Tailoring is one of the major occupations adopted by skilled people with lower socioeconomic status and education level. Tailors are unaware of chronic cloth dust exposure and its harmful effect on their respiratory system. The influence of chronic cloth dust exposure on respiratory system of tailors was assessed by measurement of peak expiratory flow rate (PEFR). The study included 30 healthy male tailors with mean age 35.07± 4.95 years and 30 healthy male volunteers with age 34.20±3.94 years. Anthropometric measurements (height, age, weight and BMI) were measured for each subject. Cardio-respiratory variables (SBP, DBP, PR, RR and PEFR) were also measured. Data were analyzed and compared between both subject groups using unpaired t - test setting the significance level at 0.05 ($p \leq 0.05$). Age, weight, height, body mass index (BMI), pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and respiratory rate (RR) were not significantly different between tailors and healthy volunteers whereas peak expiratory flow rate was significantly ($p < 0.05$) lower in tailors in comparison to healthy volunteers. Asymptomatic tailors chronically exposed to cloth dust in the present study may have subclinical expiratory function impairment of the respiratory system. It suggests a study on a large number of study populations to explore the cause of expiratory function impairment so that appropriate safety measures may be suggested.

Key words: Pulmonary function, peak expiratory flow rate, cotton dust, COPD.

INTRODUCTION

Certain occupations because of the nature of their work, location, and environment, are more at risk for occupational lung diseases than others. Repeated and long-term exposure to certain irritants on the work place can lead to an array of lung diseases that may have lasting effects, even after exposure ceases. Chronic obstructive pulmonary disease (COPD) is characterized by progressive airflow obstruction that is only partly reversible, inflammation in the airways, and systemic effects or co-morbidities [1]. Its primary cause is cigarette smoking, accounting for 80% of the disease burden. COPD is the fourth leading cause of death worldwide [2]. The prevalence of COPD is difficult to determine because the condition does not usually manifest until midlife, may be confused with other conditions and normally requires lung function assessment to confirm a diagnosis. Other environmental risk factors for COPD have also been identified. The roles of coal, cadmium, silica and biomass in the causation of COPD are relatively well established, and the role of more generic exposures to potentially harmful inhaled exposures in the workplace, are supported by evidence from a number of studies [3–10].

The industrial population is exposed to various types of pollutants present in their working environment leading to occupational diseases (11, 12). A large extent of the workers engaged in these environments are exposed to trace metals, gases, wool dust and cotton dust which can lead to unhealthy manifestations on the vital systems of the body. Respiratory system suffers the most due to its direct communication with the external environment (13). Thus, there is increased prevalence of respiratory diseases in these workers. Occupational diseases affecting respiratory system include chronic bronchitis, emphysema and bronchial asthma. The type of

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work and duration of exposure influences respiratory morbidity among these workers (14).

Risk factors that may increase susceptibility to occupational lung disease, or make it worse, include smoking, a family or personal history of asthma or allergy and occupational inhalation of cotton and dust particles [15]. Occupational toxicant exposures have an important role in many cases of lung diseases seen in workers. In Nigeria, a study has shown the role of occupational exposure to environmental pollutants in the incidence of respiratory diseases [16]. Cough, sputum production and breathlessness are some of the reported respiratory symptoms in these workers, while occupational asthma and hypersensitivity pneumonitis are recognized clinical syndromes common in such workers. The overall effect of these is a lower level of lung function in these workers [17].

There are several types of lung function test. The most informative and clinically useful tests are 'spirometry' and 'peak expiratory flow' measurements. Peak expiratory flow rate is one of the useful and simple parameter in the field of abnormalities; assessing the lung function status in general population and also for making a diagnosis and monitoring treatment of patients with bronchial asthma, chronic obstructive pulmonary disease and other occupational pulmonary diseases [18]. The peak flow meter measures airflow obstruction in the larger airways, hence, the peak flow meter can give a significant representation of the severity of airflow obstruction [19].

This study was therefore carried out to investigate the effect of exposure of cloth dust on the respiratory system, which was assessed by measurement of peak expiratory flow rate. Information obtained from the study will help to further assess the degree of occupational assault on the respiratory system, and then will recommend appropriate preventive measures that would ensure a healthier workforce.

MATERIALS AND METHODS

Subjects

Subjects were selected by using convenient sampling method. Selected subjects were then divided into 2 groups consisting of 30 subjects in each group. Group I included healthy subjects who served as control group and group II included workers working in tailoring industry. All these subjects were in the age range of 30-40 years and working in the day shift. Subjects who were smokers or on any medication, who were suffering from respiratory disorders before joining industry or suffering from cardiac diseases or who had chest deformity or who have undergone recent eye, abdominal or thoracic surgical procedures or who had history of syncope associated with forced exhalation were excluded from the study. The study was approved by institutional ethics committee.

Study procedure

Subjects who fulfilled the inclusion criteria were enrolled into the study after they signed a written informed consent. All the subjects were examined and their vitals were recorded. Height, weight and body mass index (BMI) affect the lung function parameters hence, these were measured. Body height was noted in standing upright position without shoes in meters (m). Body weight was measured in kilograms (Kg) and then body mass index (BMI) was calculated (11).

After informed consent, during the study, each subject was given adequate demonstration precisely how the tests were to be performed. Before the test, the subjects were given at least 10 minute rest. Actual experiment was conducted in the same time of the day to avoid diurnal variation. Peak expiratory flow rate (PEFR) was measured with a regularly calibrated peak flow meter. Peak expiratory flow rate of the subjects were made in standing posture with nose clip in place as recommended by the American Thoracic Society (20).

Variables recorded

a) Anthropometric variables: Age (year), height (meter), weight (kg), body mass index (kg/m^2).
b) Cardiovascular variables: Systolic blood pressure (mmHg), diastolic blood pressure (mmHg), pulse rate (beats/min).
c) Respiratory variables: Respiration rate (cycles/min) and peak expiratory flow rate (L/min).

Statistical analysis

The statistical package SPSS (version 18.0) was used to perform the analysis. For all parameters, descriptive statistics were calculated namely arithmetic mean and standard deviation. Data were analyzed and compared between group I and II using unpaired t - test setting the significance level at 0.05 ($p<0.05$).

RESULTS

Anthropometric variables (age, height, weight, body mass index) of the subjects included in the study are shown in Table 1. None of the parameters have any significant ($p<0.05$) differences between the control group and the study group.

In order to ascertain whether cardiovascular variables like systolic blood pressure, diastolic blood pressure and pulse rate in study group and control group have any significant difference, we analyzed the results of study group and control group by student's t test and found no significant ($p<0.05$) differences (Table 2).

Table 3 shows the data of peak expiratory flow rate of study group and control group. Compared with controls, the study group showed a significant ($p<0.05$) decrease in peak expiratory flow rate whereas, there is no significant differences in the respiratory rate between the groups.

Table 1: Comparison of anthropometric variables between tailors and control group.

Variables	Study group (n=30)	Control group (n=30)	p value	Significance
	Mean ± SD	Mean ± SD		
Age (yrs)	35.07 ± 4.95	34.2 ± 3.94	0.651	NS
Weight (kg)	63.83 ± 4.14	65.07 ± 3.79	0.300	NS
Height (m)	1.63 ± 0.04	1.64 ± 0.04	0.200	NS
BMI (kg/m^2)	23.92 ± 1.79	23.94 ± 1.43	1.00	NS

Table 2: Comparison of cardiovascular variables between tailors and control group.

Variables	Study group (n=30)	Control group (n=30)	P value	Significance
	Mean±SD	Mean±SD		
SBP (mmHg)	120.67±2.95	118.73±4.28	0.099	NS
DBP (mmHg)	78.67±3.72	79±3.47	0.513	NS
PR (beats/min)	73.83±3.40	72.6±2.62	0.491	NS

SBP- systolic blood pressure, DBP- Diastolic blood pressure, PR- pulse rate,

Table 3: Comparison of peak expiratory flow rate and respiratory rate between study group and control group.

Variables	Study group (n=30)	Control group (n=30)		
	Mean±SD	Mean±SD	P value	significance
PEFR (L/min)	575.5±43.55	605±67.24	0.027	S
RR (cycle/min)	16.2±1.86	16.47±1.22	0.567	NS

RR- Respiratory rate, PEFR- Peak expiratory flow rate

DISCUSSION

Nepal is one of the developing countries in South Asia and the use of new technologies and innovations are out of access for people living in this country so the use of mechanical sewing machine is still in use at large scale and dominant all over the country as well. Tailoring is one of the major occupations adopted by skilled people with lower socioeconomic status and education level.

Tailors are unaware of chronic cloth dust exposure and its harmful effect on their respiratory system. Obviously, the workers who participated in this study were unaware of the unhealthy conditions and occupational health hazards. Industrial workers in developed countries are very careful about occupational health but this issue is quite neglected in developing countries [21].

Tailors those working in cutting and sewing of cloth are exposed to high concentrations of cloth originated dust in comparison to healthy volunteers. The peak expiratory flow rate test shows a statistically significant reduction in air flow in the study group than the control group which is corroborating well with an earlier report that the reduced peak expiratory flow rate have found in patients with chronic obstructive pulmonary disease in jute mill workers [22]. The decline in peak expiratory flow rate is probably due to the accumulation of cotton dust particles in the airways, which reduces the force applied by the subject during inhalation and exhalation. This is well in agreement with another report that a decrease in FVC, FEV1 and PEFR with increasing exposure among cotton mill workers [23]. Zuskin and Valic too, found that exposure to cotton dust over the shift caused a significant reduction in mean FEV1, FVC, and PEFR in cotton workers [24]. A significant decrease in FVC, FEV1, and PEFR among all the workers was observed with increasing duration of exposure. Khan and Saadia had also made similar observations among cotton ginners in Pakistan [25]. Although in the present study we have not determined the correlation between the duration of exposure and risk of respiratory impairment symptoms among the tailors.

In our study the anthropometric variables (age, height, weight, body mass index) of the subjects have not shown any significant ($p<0.05$) difference between the control group and the study group. Also the cardiovascular variables like systolic blood pressure, diastolic blood pressure and pulse rate in study group and control group were not found to be statistically significant ($p<0.05$).

In the present study poor peak expiratory flow rate in tailors may be due to higher exposure to cotton dusts suggesting that they might have caused inflammation of airways leading to their obstruction. This study necessitates further investigation for the correlation between the duration of exposure and risk of respiratory impairment symptoms.

CONCLUSION

This study indicates that tailors are more vulnerable to subclinical respiratory impairment due to exposure to cloth dust in the working environment. It is recommended that the workers involved in this profession should use a safety measure to avoid dust entering the respiratory tract. Pictorial information about the use of safety measure or the use of masks should be displayed in the workplace to make aware of this need. Regular medical check-ups and pulmonary function test of tailors is also important for early identification of workers experiencing respiratory problems that may be related to the working environment.

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