ORIGINAL RESEARCH PAPER

Volume-7 | Issue-4 | April-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

OCCUPATIONAL RESPIRATORY SYMPTOMS AND LUNG FUNCTION IMPAIRMENT STUDY IN SWEEPERS.

Physiology

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ABSTRACT

Sweepers are at high risk of exposure to complex mixture of pollutants – soil dust, bio aerosols which make them susceptible to occupational lung diseases. We studied respiratory symptoms and lung function in 60 sweepers and 60 healthy males. Anthropometric measurements were recorded . Lung function test were performed on medspiror. 20% sweepers had breathlessness, 14% cough, 10.7% cough with sputum. There was statistically significant decrease in forced vital capacity, maximum ventilatory volume, peak expiratory flow rate, forced expiratory volume in first second in sweepers.

KEYWORDS

lung function, sweepers, pollutant.

Introduction:

In developing countries dust on the streets plays an important role in environmental pollution (1). In India street sweeping is considered as a job of the underprivileged class. Most of the street sweepers are below poverty line, without, much education dwelling in poor housing environment and without proper medical attention (2).The prevalence of occupational health hazards has been reported to be unusually high among various workers in India (3). Occupational lungs diseases top the list of major occupational illness (4).Sweepers are at high risk of exposure to complex mixtures of pollutants such as soil dust, bio aerosols of biological origin like pollens, organic materials from plants, dust resulting from vehicular movements and emissions which make them susceptible to occupational lung diseases (5). The inhalation of ambient particles and their deposition in the lung, can interact with lung cells and may have adverse effects. These interactions eventually lead to the release of various cytokines, causing inflammatory reaction and tissue injury (6). Hence the study is designed to assess the respiratory symptoms and lung function status of sweepers exposed to dust generated from street sweeping and age, height, weight, socioeconomic matched controls .

Methodology:

This was a case control cross sectional study, conducted in Pulmonary Physiology Laboratory. Ethical committee approval was taken and informed written consent was signed . Total 120 subjects in the age group of 25-40 years were included.

Subjects were divided in two groups.

Study group comprised of 60 sweepers with work experience of 5-15 years. They worked for 6-8 hrs / day and six days / week without using any self protective measures. Control group consist of 60 age, weight, height and socio economic status matched control.

Diagnosed cases of Bronchial asthma, chronic bronchitis, emphysema, tuberculosis, ischemic heart disease, malignancy, drug addicts, cigarette smokers, tobacco chewers, alcoholics were not included. Subjects with gross clinical abnormalities of vertebral column thoracic disease, neuro muscular disease and engaged in other occupation known to cause alteration in lung function [cotton spinning mill workers, flour mill workers, paint industries, coal mine workers, bakers, cement factory workers] were excluded.

Methods

The detailed clinical history was recorded and examination was done. The subjects were asked to report in groups of three, at 10 am in the department. The designed validated questionnaire was given to the subjects. The anthropometric measurements were recorded. Standing height (in m), weight (in kgs), was recorded. BMI was calculated using Quetelet's index.

BMI = Weight in Kgs/Square of height in meters.

The subjects were not allowed to drink or eat anything 2 hours prior to test. Lung function test was performed on Medspiror. Spirometry was performed based on the operation manual of the instrument. The detailed manoeuvre was explained and demonstrated to the subject. The subjects performed the test thrice and the best of the three reading was taken. Statistical analysis of the observation was carried out using graph pad instant version 3.1. The data was expressed in the terms of mean and standard deviation and inferential statistics was determined using unpaired student "t" test.

Observations And Results

Sweepers had breathlessness (20%), followed by cough with breathlessness (16%), cough (14.7%) and cough with sputum (10.7%).

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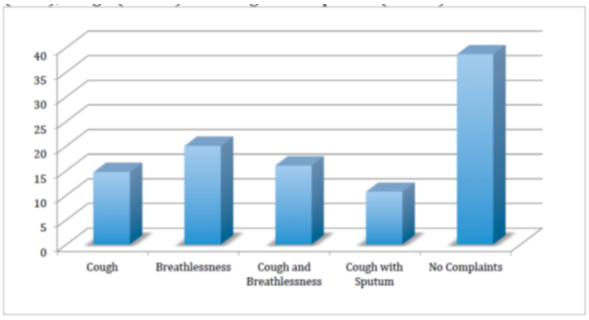

Graph showing respiratory symptoms

There was statistically significant decrease in Forced Vital Capacity (FVC), Maximum Ventilatory Volume (MVV), Peak Expiratory Flow Rate (PEFR), Forced Expiratory Volume in first second (FEV1), and Forced Expiratory Flow 25%--75% of volume as percentage of Vital Capacity (FEF 25%--75%) in sweepers. There was significant increase in ratio of Forced Expiratory Volume in first second to Forced Vital Capacity (FEV1/FVC(%) .

Observation -Table

Parameters	Subjects mean ± std. deviation	Control groups mean ± Std. deviation	P value
Age (Years)	32.5 ± 6.28	31 ± 4.42	NS
Height (m)	1.59 ± 0.17	1.60 ± 0.15	NS
Weight (kgs)	58.3 ± 5.7	58.7 ± 7.9	NS
BMI (kg/m²)	23.06 ± 1.70	22.92 ± 2.44	NS
FVC (L)	1.88 ± 0.588	2.69 ± 0.636	HS
FEV 1(L)	1.68 ± 0.52	2.21 ± 0.570	HS
PEFR (L/s)	5.56 ± 1.32	7.62 ± 1.2	HS
FEF25-75(L/s)	2.33 ± 0.93	3.2 ± 0.552	HS
FEV1(FVC (%)	94.95 ± 4.22	82.15 ± 3.73	HS
MVV (L/min)	73.14 ± 15.2	113.52 ± 18.6	HS

Discussion:

In the present study we evaluated the association between exposure of dust to sweepers with respiratory symptoms and pulmonary function tests. In our environment, street sweeping with brooms without precautionary measures affects the respiratory system. The study showed a statistically significant decrease in the mean values of FVC, FEV1, PEFR, FEF25-75% and MVV in sweepers as compared to the controls. But FEV1/FVC ratio was increased and it was also significant. The parameters, FVC, FEV1 and FEV1/ FVC provide the best method of detecting the presence and severity of airway obstruction or restriction, as well as the overall respiratory impairment. In the study, FVC and FEV1 were decreased, but the FEV1 /FVC ratio was increased and it was more towards restrictive pulmonary impairment. PEFR values which are especially valuable in the diagnosis of obstruction were also reduced in the study. FEF 25-75%, the more sensitive indicator of small airway obstruction was also found to be reduced. All the above findings suggested both restrictive and obstructive lung function impairments in sweepers, which may be attributed to inhalation of mixture of dust which affects the airways in different ways. FVC measures "Ventilable" lung volume; a decrease therefore reflects, (1) Restriction secondary to pulmonary or pleural fibrosis. (2) Air trapping secondary to airway obstruction.(7) The reduction in FEV1 & PEFR is associated with chronic sweeping can be partially explained by loss of lung elastic recoil pressure which reduces the force required to drive air out of the lung. This loss of elastic recoil pressure is attributed to microscopic enlargement of air spaces rather than to grossly visible emphysema.(7)

A study on Nigerian female sweepers reported an apparent reduction in all the mean lung function values, even though it is not statistically significant [4]. Similarly, a study on sweepers in inner and outer regions of Bangkok metropolis showed that the mean FVC, FEV1 and FEF 25--75% of the street sweepers were significantly lower than the mean predicted values (8). The findings were similar to those of a population based study in Spain, which showed that pulmonary function parameters were lower in subjects highly exposed to dust, such as cleaners and road sweepers, with a decrease in FEV1 and FEF 25–75%, but in contrast to our findings, they found a decrease in FEV1/FVC ratio. It was also reported that symptoms of chronic bronchitis and cough were more frequent in them (9). Similarly, two other studies which were conducted on sweepers revealed that chronic respiratory diseases like chronic bronchitis, asthma and bronchiectasis were significantly high among street sweepers. Inhalation of foreign materials can cause the lungs to react in wide variety of ways, irritating the airways, exacerbating the conditions such as asthma and setting up an inflammatory reaction and fibrosis. (6) Chronic exposure to dust among sweepers has lead to significant lowered values of pulmonary function test as compared to non--exposure group.

Conclusion:

The exposure to dust in sweepers has an immediate irritating effect on the respiratory tract, leading to some degree of lung function impairment. Protection of the workers with appropriate respiratory protective masks and educating them suitably are recommended. Effective dust--control measures such as wetting the surface before sweeping, definitely reduce acute respiratory health hazards. Periodic assessment of pulmonary function by spirometry has to be done.

References :

1. Nku CO, Peters EJ, Eshiet AI, Oku O, Osim EE. Lung function, oxygen saturation and symptoms among street sweepers in Calabar-- Nigeria. Nigerian Journal of Physiological Sciences 2005;20(1-- 2):79–84.
2. Yogesh SD, Zodpey SP. Respiratory morbidity among street sweepers working at Hanumannagar Zone of Nagpur Municipal Corporation, Maharashtra. Indian J Public Health. 2008;52(3):147– 49.
3. Smilee Johncy S., Dhanyakumar G., Vivian Samuel T., Ajay K.T., and Suresh Y. Bondade . Acute Lung Function Response to Dust in Street Sweepers J Clin Diagn Res. Oct 2013; 7(10): 2126–2129.
4. Park K. In: Park's textbook of preventive and social medicine. 18th ed. Jabalpur: M/s Banarsidas Bhanot; 2007. Occupational health; pp. 608–10.
5. Marziale MH, De Carvalho EC. The occupational risks in urban cleaning: street sweeping. Rev Gaucha Enferm. 1989;10(1):71–81.
6. Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL. Environmental lung diseases. In: Harrison's principles of Internal McGraw Hill Companies, 2008; 1521--27.
7. Amato F, Querol X, Alastuey A, Pandolfi M, Moreno T, Gracia J, et al. Evaluating urban PM10 pollution benefit induced by street cleaning activities. Atmospheric Environment. 2009 ;43:4472–80.
8. Wasuthep Boonchoo. A comparative study of lung function of street sweepers in inner and outer regions of Bangkok metropolis. Dissertation. Thailand: Mahidol University, 2005.
9. Jordi Sunyer, Manolis Kogevinas, Hans Kromhout, Josep M Antó, Josep Roca, Aurelio Tobias, et al. Pulmonary ventilatory defects and occupational exposures in a population--based study in Spain. Am J Respir Crit Care Med 1998; 157: 512–17.