Original Research Article

Effect of air pollution on petrol pump workers: A observational study

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Abstract

Background: Lungs are the primary target organ of all the inhaled pollutants. Such residency is linked with the exacerbation of asthma, respiratory morbidity and mortality in patients with chronic obstructive pulmonary disease (COPD), and increased risk of viral respiratory infections. **Objective:** To evaluate the effect of air pollution on lung function test (FVC and FEV_1) in petrol pump workers. **Material and Methods:** The present comparative cross sectional study conducted at tertiary care Hospital. The study subjects comprised of thirty males who were working in different petrol pumps. There were thirty controls which comprised of healthy adult males. The present study was approved by the Institution Ethical Committee. The pulmonary-function tests were studied by using a computerized spirometer after taking informed consent. The parameters measured were forced vital capacity (FVC) and forced expiratory volume at one second (FEV_1). **Results:** The mean FVC value in petrol pump workers and controls was 3.06 ± 0.43 litters and 3.38 ± 0.52 liters respectively with statistically significant difference. ($p<0.05$) The mean FEV_1 value was 2.94 ± 0.54litres in control group and 2.55 ± 0.53 liters in petrol pump workers with statistically significant difference. ($p<0.05$). **Conclusion:** Hence, the study concludes that exposure to petrol fumes and automobile exhaust markedly decreases pulmonary function of petrol pump workers.

Key Words: Petrol Fumes, FEV1, FVC.

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INTRODUCTION

Air pollution is an important public health problem in most cities of the developing world. This association is probably due to growing industrialization and an increase in the use of motor vehicles. The major sources of air pollution are the flue gases, emission from refineries and factories, etc., on one hand; and exhaust emissions from vehicles on the other hand. Pollution from vehicles especially automobiles is responsible for about two third of air pollution in the urban area.[1] The internal combustion engines need a mixture of air and fuel to burn and produce energy to propel the vehicle. These burnt gases which come out of the exhaust are responsible for pollution. In petrol engines, the gases comprise a mixture of unburnt hydrocarbons (HC), Carbon Monoxide (CO), Oxides of Nitrogen (NO_2), sulphur oxides, (SO), lead (Pb) and suspended particulate matter (SPM). SPM is a general term that refers to a complex mixture of solids or liquids that vary in number, size, shape, surface area, chemical composition, solubility, and origin.[2] The main components of PM, originating from road transport, are engine emissions, brake and tyre wear, and dust from road surfaces. The largest single source of airborne SPM from motor vehicles is derived from diesel exhausts. If these gases are in excess quantities, vehicular pollution is caused.[3] Lungs are the primary target organ of all the inhaled pollutants. Such residency is linked with the exacerbation of asthma, respiratory morbidity and mortality in patients with chronic obstructive pulmonary disease (COPD), and increased risk of viral respiratory

infections. In view of this, cellular and functional lung activity is generally assessed to get an estimate of the health impact of air pollution. Lung function could be quantitatively measured using a broad array of tests that measure lung volume, airflow and gas diffusion.

MATERIAL AND METHODS

The present comparative cross sectional study conducted to study lung function test at tertiary care Hospital that serves to population of diverse groups. The study subjects comprised of thirty males who were working in different petrol pumps located in areas having large trafficking of vehicles throughout the day. There were thirty controls which comprised of healthy adult males. The subjects were selected by simple random sampling. The present study was approved by the Institution Ethical Committee. The informed written consent was taken from study group after explaining the procedure to them. The pulmonary-function tests were studied by using a computerized spirometer. The parameters measured were forced vital capacity (FVC) and forced expiratory volume at one second (FEV_1). The Individuals in study group were males of age 25-35 years and Control group individuals were age and sex matched healthy individuals. Individuals with any history of habit of smoking, tobacco chewing, alcohol intake, history of any respiratory diseases in past or respiratory symptoms at present and cardiac pathology were excluded from study. The two groups were compared by using unpaired 't' test and p value of less than 0.05 was considered significant.

RESULTS

The age and anthropometric parameters of study group were age 29.30 ± 5.12 years, weight 58.45 ± 9.18 kg, height 165.16 ± 7.41cms while that of controls were age 30.13 ± 5.46 years, weight 60.78 ± 9.16 kg, height 168.63 ± 4.37cms. The two groups did not differ significantly on these parameters.

Table 1: Comparison of FVC between two groups

Sr. No.	Spirometric measurements	Control group (n=30)	Study group (n=30)	p-value
1.	FVC (L)	3.38 ± 0.52	3.06 ± 0.43	<0.05*

(Values are expressed as Mean ± SD; * p value < 0.05 Significant)

Table 2: Comparison of FEV_1 between two groups

Sr. No.	Spirometric measurements	Control group (n=30)	Study group (n=30)	p-value
1.	FEV_1 (L)	2.94 ± 0.54	2.55 ± 0.53	<0.05*

(Values are expressed as Mean ± SD; * p value < 0.05 Significant)

DISCUSSION

The present study was designed to quantify resulting abnormalities in lung function in subjects exposed to petrol vapours as compared to their age and BMI matched controls. The present study demonstrates that prolonged exposure to petrol fumes and automobile exhaust markedly decreases pulmonary function of petrol pump workers.

Forced vital capacity (FVC): In the present study mean FVC value in controls was 3.38 ± 0.52 litres and for petrol pump workers 3.06 ± 0.43 litres. Values decreased in petrol pump workers than control groupindividuals. And the difference in mean value was statistically significant (p value <0.05).

Forced expiratory volume in 1 second (FEV_1): In the present study the mean FEV_1 value was 2.94 ± 0.54litres in control group and it was 2.55 ± 0.53litres in petrol pump workers. On comparison FEV_1 values are lower in petrol pump workers as compared to control subjects, and the difference was statistically significant (p value <0.05). Although FEV_1 and FVC both decreased in petrol pump workers their ratiodid not differ between the two groups. This finding indicates the restrictive nature of pulmonary involvement in the petrol pump workers. The above observations were consistent with the study observations of Keshavchandran *et al*[4], Sadiqua Begum *et al*[5] and Nazia Uzma *et al*.[6] FVC and FEV_1 are determined principally by manoeuvres in which expiration is forceful and rapid. The physiologic mechanisms determining the flow rate during the process of forced expiration are elastic recoil of the lung, the airway resistance and the airway compliance. As petrol pumps are located on busy roads, the workers in addition to petrol vapours are also exposed to automobile exhausts and other air pollutants. Automobile exhaust is a complex mixture of different gases like nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), carbon dioxide (CO_2) and particulate matter. Animal studies have demonstrated that exposure to particulate matter combined with exposure to an irritant gas such as NO_2 results in greater damage to the lungs than when exposed to either substances individually[5] The inhalation of toxic particles and gases targets the natural defenses of the lung by increasing epithelial permeability, decreasing mucociliary clearance, and depressing macrophage function. Although individual air pollutants will exert specific toxic effects on the respiratory system, a common chain of molecular events ensue. Human, animal, and *in vitro* experimental studies have demonstrated an increased recruitment and activation of inflammatory cells, and the generation of an array of inflammatory mediators, as well as the activation of intracellular oxidative stress via the generation of free radicals and depletion of protective small molecular

weight antioxidants,[7] and antioxidant enzymes.[8] The spectrum of pathological effects in the lung resulting from occupational exposure to NO_2 range from mild inflammatory response in the mucosa of the tracheobronchial tree at low concentrations, to bronchitis, bronchopneumonia and acute pulmonary oedema at high concentrations. The duration of exposure to petrol fumes was not studied separately. This was limitation of the study. Future studies with larger sample size and duration of exposure should be done.

CONCLUSION

The present study concludes that exposure to petrol fumes and automobile exhaust markedly decreases pulmonary function of petrol pump workers.

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