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Research Paper

Prevalence of Lung Function Abnormalities in Petrol Filling Workers

Medical Science

KEYWORDS : Petrol/diesel vapors, Prevalence, air pollutants, pulmonary function

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ABSTRACT

Background

Petrol filling workers are exposed to petrol and diesel vapors during there working hours. Air pollutants from motor vehicles and surrounding area can have additional deleterious impact on respiratory hygiene of petrol pump workers. Hence purpose of present study was to assess the Prevalence of altered pulmonary functions in petrol-pump workers

Methods

A cross sectional observational study was conducted at 33 randomly selected petrol pumps of Ahmedabad city. Total 215 non smoker petrol filling workers undergone for pulmonary function testing. Spirometry parameters measured were FVC, FEV1, FEV1/FVC, PEFR and FEF25-75.

Results

Overall prevalence of Lung function abnormalities was 42 %. Prevalence of small airway obstruction was highest (40 %). Prevalence of obstructive, restrictive and mixed type of impairment was 2 %, 32% and 17 % respectively. Results also showed that there was no association between presence of lung function abnormalities and duration of exposure.

Conclusion

Study concludes deleterious impact of air pollutants and petrol/diesel vapors on pulmonary function of petrol pump workers. Results suggest need for control measures and strategies to improve and protect respiratory health of petrol pump workers.

Introduction

Petrol is a complex combination of hydrocarbons. About 95 % of components in petrol vapors are aliphatic and acyclic compounds and less than 2 % aromatics. The benzene content of petrol has typically been in the range of 1-5 % but may have risen following removal of lead additives. [1,2]

Health effects of occupational exposure to gasoline and air pollution from vehicular sources are relatively unexplored among petrol filling workers. Neglect of ventilation in workplace or failure to use personal protective equipment when using petrol containing solvents like benzene will increase incidence of toxic effects of benzene in humans.[3] The toxic effects from benzene include hematotoxicity, carcinogenicity, neurotoxicity and immunotoxicity. Acute poisoning can lead to death with higher exposures are associated with inflammation of respiratory tract and hemorrhage in the lungs. Various occupational solvents like benzene and atmospheric air are absorbed in to human body either through respiratory tract or epidermal contact. These may cause primary respiratory symptoms and impaired pulmonary and dermatological functions.[4] Numerous epidemiological studies have documented decrements in pulmonary function and various other health problems associated with long term air pollution exposure.[5-8] Health problems posed by the pollutants at the work environment of an individual are closely related to the nature and level of exposure to these hazardous chemicals. It has been known for quite sometime that air pollution from diesel exhaust is a major respiratory hazard for workers exposed to it in enclosed space.[9]

Petrol evaporates more readily in hot than cold countries. In India, petrol- pump attendants are the norm rather than self service, increasing the opportunity for exposure. Petrol pump attendants do not wear personal protective equipment and personal hygiene is variable in the work place. Under prevailing working conditions benzene can be absorbed in the lungs by inhalation. Studies on health conditions in petrol-pump workers have concentrated on clinical symptoms with limited reports on lung function or respiratory morbidity of workers exposed to petrol-pump vapour.[10] . The purpose of present study was to find out prevalence of lung function abnormalities in petrol filling workers.

Materials and Methods

A cross sectional observational study was conducted at 33 out of 107 randomly selected petrol pumps from different 5 zones of Ahmedabad city. Total 215 petrol filling workers were selected on the basis of following criteria.

Inclusion criteria:

1. Healthy male petrol pumps workers with age between 20-50 years.
2. Working as petrol/diesel filling worker at petrol pump since > 1 year at least for 8 hrs/day.
3. Willingness to participate in study.

Exclusion criteria:

1. Smoking habit or history of smoking
2. History of any respiratory illness.
3. Musculoskeletal abnormalities involving upper trunk or rib cage
4. Neuromuscular disease

All subjects were first evaluated by a questionnaire. Pulmonary Function Testing was done by computerized PFT machine (RMS MED SPIRER, Helios 401). PFT was done in sitting position and guidelines of American Thoracic Society were followed.[11] Subjects were instructed about the procedure of FVC maneuver. They were asked to do three efforts. The best value of three was recorded. They were given proper rest in between each trial. The parameters studied were FVC (Forced Vital Capacity), FEV1 (Forced expiratory volume in 1 second), FEV1/FVC, FEF_{25-75} (average forced expiratory flow rate over middle 50 % of vital capacity) & PEFR (Peak Expiratory Flow Rate).

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Respiratory impairment was classified on the basis of following criteria: [10, 12]

1. **Restriction:** FVC< 80 % predicted

2. **Obstruction:** FEV1 or FEV1/FVC % < 80 % predicted

3. **Combined :** FVC < 80 % predicted, FEV1 < 80 % of predicted, FEF_{25-75} < 65 % of predicted

4. **Small airway obstruction :** FEF_{25-75} < 65 % of predicted [13]

Results

Total 215 petrol filling workers undergone for pulmonary function testing. Table 1 and Table 2 shows distribution of workers according to age and years of exposure. Total 91 out of 215 (42 %) workers were having abnormal lung function. Table 3 and Figure 1 shows prevalence of lung function abnormalities according to type of respiratory impairment. Results also showed that there was no association between years of exposure at petrol pump and presence of lung function abnormalities. (Table 4)

Discussion

Results showed that prevalence of lung function abnormalities in petrol pump workers is 42 % even though all workers were asymptomatic and non smokers. Previously studies have been performed in petrol pump workers and petrol filling workers. [14-17] In these studies, lung function impairment was seen. Results showed that prevalence of restrictive type of respiratory impairment was 32%. Previous studies have also found similar type of picture. 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 [18]. Zuskin et al, Lee et al found that the exposure to solvents at work place had significantly more respiratory symptoms than control group [19, 20].

Results also showed that there was no association between years of exposure at petrol pump and presence of lung function abnormalities. Similar findings were seen in study done by S.S. Chaughle et al in 2008 among 33 petrol pump workers.[21] In contrast to this, study done by Nazia et al in 2008 showed that as work exposure was increased to > 10 years, restrictive pattern of impairment changed to mixed pattern of lung disease.[22] Most of petrol pumps were located on busy road. In a health survey done by CSE (Centre for science and environment, New delhi), level of PM 10 has been found 35,100 ton in Ahmedabad which was quite high compared to other 5 cities.[23] Thus high level of air pollution may be contributing factor for respiratory impairment in petrol pump workers. Exposure to petrol and diesel vapors in USA has been restricted by use of rubber hood over delivery pump, self service stations and use of personal protective equipments.[24] In India, there is no standardization about numbers of workers and their duration of work at a single petrol pump.

Conclusion

Study concludes presence of lung function abnormalities in petrol pump workers even though they were healthy and non smokers. The study has given in depth view on different types of lung function abnormalities among petrol pump workers on the basis of pulmonary function test values. Small airway obstruction and restrictive type of lung function abnormalities were more prevalent compared to other two abnormalities.

Table 1. Age wise distribution of subjects

Age Group (Years)	No of subjects	%
20-25	57	26.51
26-30	60	27.90
31-35	35	16.27
36-40	28	13.02
41-45	11	5.11
46-50	24	11.19
TOTAL	215	100

Table 2. Distribution according to duration of exposure

Years of experience	NO of subjects	%
1-5	70	32.55
6-10	77	35.81
11-15	32	14.88
16-20	13	6.04
21-25	10	4.65
26-30	13	6.04
TOTAL	215	100

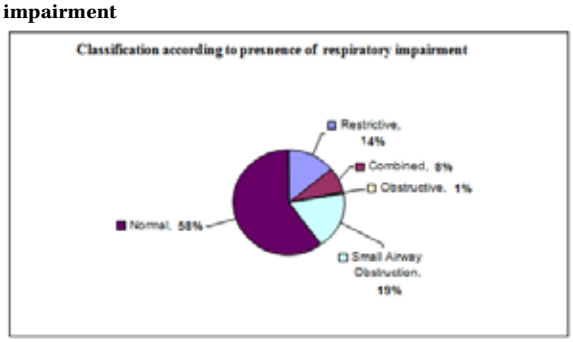
Table 3. Prevalence of lung function abnormalities

No	Type of impairment	No of workers
1	Restrictive Lung Disease	32 (14%)
2	Obstructive Lung Disease	2 (1%)
3	Combined Lung Disease	17 (8%)
4	Small Airway Obstruction	40 (19%)
	Total	91 (42%)

Table 4. Association between years of exposure and presence of lung function abnormalities.

Years of exposure	No of workers affected	No of workers unaffected	Total	Chi squared value (At 5% level of significance, df =1)
< 5 years	24	40	64	1.40 (P>0.05) Not significant
≥5 years	67	84	151	
Total	91	124	215	

Figure 1 Classification according to Presence of respiratory impairment



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