



PULMONARY FUNCTION TEST ABNORMALITIES AMONG PETROL PUMP WORKERS IN DAHOD SMART CITY GUJARAT

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ABSTRACT The response of the human lungs to exposure to various particles like seen in atmospheric pollution, work place, various gases, have been studied in different populations by various studies. The pollution level in DAHOD Smart city is moderate. To understand the effect of petrol and diesel vapours on lungs in persons working at petrol pump stations through Spirometry. This study was conducted at 25 Petrol pumps. Total participants were 250. Of these, 123 were workers [Group I] and 127 were office employees working in the pump stations [Group II]. Spirometry was successfully performed on 102 workers [Group I] and on 102 office employees [Group II] who were also used as healthy controls. The Spirometry values were significantly reduced in participants working in the petrol pumps as compared to the controls. The reduction further increased with prolonged duration of exposure. This study concludes that the respiratory function declines in those persons working in petrol pumps due to constant exposure to petrol and diesel fumes and the degree of impairment increases with the duration of exposure.

KEYWORDS : Air pollution, Petrol/Diesel Fumes, Restrictive lung abnormality, Spirometry

INTRODUCTION

A survey conducted by Centre for Science and Environment (CSE), New Delhi shows that 80% of cities in India exceed the PM10 (Pollutants that emit particulate matter of less than 10µm in size). 90 cities have a critical level of PM10 and 26 cities have very critical PM10. In a study involving 6 cities of India³ (Chennai, Pune, Patna, Indore, Rajkot, Surat and Ahmedabad) the measured annual PM10 concentration in µg/ m³ averaged 73.1± 33.7 in DAHOD, exceeding the annual standard of 60 µg/ m³. Currently the PM10 in the suburbs of DAHOD is much higher than the city. A study was conducted in Italy to determine the exposure of petrol pump workers to the Benzene content of petrol, which showed the highest concentration of benzene in the breathing zone of petrol pump workers. This study also showed that almost 88% of the benzene is emitted while filling the petrol into the tank. The harmful effects of benzene has been studied in various studies on gasoline workers and was shown to have toxic effects on the haematological parameters, liver toxicity and definite neurotoxicity. As the petrol pump workers work constantly for more than 8 hours per day for 6 days a week and thus being constantly exposed to petrol/diesel fumes, are at a high risk of developing lung function abnormalities even though they are asymptomatic. Hence the primary aim of this study is to assess the lung function abnormalities of these petrol pump workers working in suburban areas, by Spirometry.

MATERIAL AND METHODS

A total of 25 petrol pumps were selected randomly. From these 25 petrol pumps, a total of 250 subjects were screened. Of this, 102 non-smoking workers who successfully performed Spirometry were selected as study group (Group I). The Group I workers were matched with a similar number (102) of non-smoking office employees for age, sex, height and weight (Group II). Smokers in either group were excluded. **Inclusion Criteria** Willing to participate in the study Age: 20-45 years Worked in the petrol pump for > 1 year, at least 8 hours a day. **RESULTS** Able to perform spirometry **Exclusion criteria** Not willing to participate in the study Unable to perform Spirometry History of any other respiratory illness History of recent surgery History of neuromuscular abnormalities History of musculoskeletal abnormalities History of smoking – current or past Initially the demographic data, duration of working in the petrol pump, smoking history, use of protective gears, medical and surgical history were collected from each participant and were subjected for a Spirometry, after obtaining due consent.

RESULT

Total number of participants:250, Group I (Petrol pump workers), No. of subjects screened: 123, No. of screen failures:21, No. of eligible subjects:102, No. of subjects working more than 5 years:61, Group II

(Controls) No. of subjects screened:127, No. of screen failures:25, No. of eligible subjects:102, No. of subjects working more than 5 years: 5. The predicted values of FEV1, FVC and PEFR were compared with the actual values in both the groups. This showed a moderate reduction in the Group I. Also, the observed FEV1/FVC showed an increase. In addition, result shows that the observed mean PEFR shows a reduction (76% predicted) compared to the predicted PEFR. Comparison of the predicted and observed mean values of the Spirometry parameters in the controls showed normal or near normal (more than 80% predicted) values in comparison with the predicted values. In comparison, the values of FEV1, FVC and PEFR were not decreased in Group II. This shows a significant reduction in the mean values of FEV1, FVC and PEFR in the Petrol pump workers (Group I) compared to the control group (Group II). The FEV1/FVC is increased in both the groups. The FEV1/FVC showed an increase in Group II. Also, the PEFR values are comparatively low in the petrol pump workers who had worked for more than 5 years when compared to those workers who had worked for less than 5 years. This shows that as the duration of exposure is more, there is an element of obstruction seen in these workers.

DISCUSSION

Petrol is a combination of complex hydrocarbons. On emission, particles of size 0.02µm are generated. Due to the large surface area, these particles carry various toxic particles, which remain in the atmosphere for longer period and get deposited in the small airways of the lung. Also, in a study done by Uzma et al, it has been proved that Carbonmonoxide (CO) concentration is very high in those areas surrounding the petrol pumps during the peak hours in comparison with the residential areas, subjecting those in the vicinity of petrol pumps at a high risk of respiratory abnormalities. In addition, as these petrol pump workers are not wearing any protective gear, this exposes them to have more of lung function abnormalities. In India there is no standardisation regarding the number of petrol pumps in a particular area. Further, most of the petrol pump workers belong to the lower socioeconomic class predisposing them to various illnesses. This study had excluded those petrol pump workers who had or have a history of smoking. Installation of a petrol vapour recovery system has controlled the occupational exposure to petrol/diesel compounds in many countries. The Department of Environment, Climate change and Water, Government of New South Wales has published standards and guidelines for vapour recovery at the petrol pumps. The Stage I vapour recovery system limits the emissions of volatile organic compounds that result from unloading petrol from the tanker into the petrol pump storage tanks. The Stage II vapour recovery system is designed to capture the vapour during the refuelling of the vehicles at the petrol pumps. A study done by Agip Petroli showed that introduction of the vapour recovery system will be

capable of reducing up to 80% benzene emission. Thus in india the installation of petrol vapour recovery systems across various petrol pumps would help to bring down the pollution by petrol/diesel fumes. Periodical lung function measurements like Spirometry should be undertaken for the workers at the petrol pumps.

CONCLUSIO

This study shows that persons working in petrol pumps have respiratory abnormalities in the form of restrictive lung impairment. This impairment increases as the duration of exposure at workplace increases. Further studies in the form of Diffusion Capacity of the lung for Carbon monoxide [DLCO], other markers of pulmonary impairment like exhaled Nitric Oxide levels (FeNO) are needed to explore the effects of these toxic substances.

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