Impact of Automobile Emission on Pulmonary Function Parameters of Non-Smoking Road Side Vendors and Shopkeepers

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Abstract

Background: Airborne dust plays a major part in the overall atmospheric pollution and motor vehicle emissions constitute the most significant source of ultra particle in urban environment. Traffic related air pollution is an occupational health hazard to individuals who work close to traffic.

Objectives: To assess the impact of dust and traffic related air pollution on pulmonary functions of the exposed, non-smoking road side shopkeepers at busy traffic congested areas and to compare with age and sex matched non-smoking shop keepers from residential localities.

Materials & Method: Cross-sectional study was conducted on 60 healthy adults aged 20-40years. 30 shopkeepers exposed to dust and traffic pollution residing nearer to busy road-crossings of Vijayapura city. Control group is 30 age and sex matched non-smoking, non-exposed healthy subjects who are working in shops away from the road traffic pollution. Anthropometric parameters, Physiological Parameters, Pulmonary function test were recorded in both control and subjects using standard techniques. Statistical analysis is done using SPSS.

Results: We observed a significant reduction of FVC [subjects-2.63+0.40,control- 2.63+0.40,(p=0.03)] and FEV1 [subjects-2.47+0.59,control- 1.75+0.42,(p=0.000)] and an insignificant reduction of PEFR [subjects-506.00+34.07,control-488.66+27.89,(p=0.610)] among the road side shopkeepers.

Conclusion: The results of the study indicate the possibility of impaired lung function or obstructive lung disorders among the shopkeepers exposed to higher traffic pollution.

Keywords: *Automobile emission, FEV1 ,FVC, PEFR, shopkeepers, traffic air pollution*

Introduction

It is well documented that air pollution is associated with a number of respiratory and cardiovascular adverse health effects.(1) Air pollution generated by motor vehicle exhaust has become a major cause of scientific and public concern world -wide. The rapid and marked increase in motor vehicular traffic and its associated gaseous pollutants in the urban areas have caused a sharp increase in prevalence of respiratory allergies.(2) Road traffic produce volatile organic compounds, suspended particulate matter, oxides of sulphur, oxides of nitrogen and carbon monoxide which makes adverse health effects on exposed population.(3) Airborne dust plays a major part in the overall atmospheric pollution and motor vehicle emissions constitute the most significant source of ultra particle in urban environment. Traffic related air

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pollution is an occupational health hazard to individuals who work close to traffic. Shopkeepers nearer to various traffic junctions through which maximum numbers of vehicles pass and they are more prone to develop health hazards of automobile exhaust on respiratory system.[4]

In a study by Kunzli et al. (2000)[5] estimated that in European countries France, Switzerland and Austria, with a total population of 74 million inhabitants, 3% of total mortality per year (i.e. 20,000 deaths) are due to traffic emissions alone; hypothetically total omission of traffic emissions would lead to prolonged life expectancy of 0.35 years.

Areas with increased Ozone and automobile exhaust had a higher prevalence of asthma in all regions. The results of the study by Schmitz Berger *et al.*, (1993)[6] provide evidence that outdoor pollution is a risk factor for childhood respiratory health.

Many studies suggest that there is an adverse effect on health following exposure to traffic pollution. No such studies have been carried out in this part of the country particularly on busy road side shopkeepers.

Vijayapura is one of historic and fast growing city of Northern Karnataka (India) .The growth is associated with an enormous increase in vehicular traffic emitting exhaust and polluting the atmosphere. City pollution is entirely due to automobile exhausts as main city has no industries which can be blamed for air pollution of city.

Many studies have been carried out to examine the relationship between lung functions and exposure to traffic pollution in traffic policemen. But in India least studies done to know the effects of air pollution on residents, shopkeepers or school children who are residing in close proximity with busy road crossings and exposed to dust and traffic pollution. In view of this, our study is aimed to assess the effects of dust or possible traffic pollutants on pulmonary functions of road side shopkeepers.

Materials & Method

Cross-sectional study was conducted on 60 healthy, non-smoking male individuals in age group of 20-40 years who are residents of Vijayapura city since 15 years or more.

In order to study the impact of vehicular pollution on pulmonary functions, 30 individuals who are shopkeepers (book stall, provisional stores, juice centres, ice-cream parlours, vegetable stalls, chat centres, fruit stalls etc) and exposed to dust and traffic pollution for about 8-10 hours daily have been selected. These subjects were residing along busy road (2-3 kms long) passing besides BLDE(Deemed to be University) campus and connecting to NH-13, a connecting road between Vijayapura (Karnataka) and Solapur (Maharastra) where approximately 1200-1500 vehicle pass per hour.

Control group included 30 healthy, non-smoking male shopkeepers from residential area which is away from the busy roads (where about 10-20 vehicles pass per hour) and they were from same socio-economic group and have similar life style as that of subject group.

With 5% level of significance and power of test 90%, the anticipated mean difference of FEV1as 1.34% between comparison groups and anticipated distendable deviation as1.4,the minimum sample size per group is 28, hence we have incorporated the sample size as 30 per group.

Institutional Ethical Committee clearance and consent from the participants were obtained.

Following thorough history taking and general physical examination, the individuals with history of smoking, heart/pulmonary disorders, musculoskeletal abnormalities, obese and malnourished individuals, drivers and shop keepers of drug stores, vehicle repair shops, were excluded from the study.

The Anthropometric parameters like Height (cms) and Weight (kgs) were measured. Using these parameters Body Surface Area (BSA) and Body Mass Index (BMI) were calculated.

Physiological parameters like Respiratory rate (cycle/min),Heart rate (beats/min) and Blood Pressure (mmHg) were recorded using standard techniques.

Pulmonary function parameters recorded were FVC (L),FEV1(%) & PEFR (L/min). FVC & FEV1(%) were recorded using computerized spirometer-'SPIROEXCEL', PEFR was recorded using Mini Wright's Peak flow meter. The testing was performed in the relaxed sitting position after adequate demonstration,

motivation and encouragement.

Statistical analysis was done using SPSS version 16.0. Mean and Standard Deviation (SD) of all parameters was taken. Unpaired t-test was applied to know the statistical significance.

Results

Table I: Anthropometric and Physiological parameters of both control and study groups.

Parameters	Control group (n=30)	Study group (n=30)	P-value
Age (years)	32.43 + 5.59	30.00+4.21	0.062
Height (cms)	165.53+7.52	165.03+7.46	0.797
Weight (Kgs)	66.46+10.74	63.23+9.07	0.213
Body Surface area (Sq m/m2)	1.72+0.15	1.70+0.18	0.710
Body Mass Index (Kg/m2)	24.43+3.96	22.98+3.08	0.119
Pulse rate (Beats/min)	84.30+13.29	77.73+11.78	0.048*
Systolic Blood Pressure (mm Hg)	123.93+10.79	123.66+9.29	0.919
Diastolic Blood Pressure (mm Hg)	78.66+9.05	76.40+8.05	0.310

*P<0.05- significant, ***P<0.001-very highly significan

Table I shows the comparison of anthropometric and physiological parameters in residential and traffic exposed shop keepers. It can be seen that there is a statistically significant difference in the pulse rate of control and study groups however, both the valuess are within normal range. No statistical changes in BMI and BSA of both study and control group of our investigation suggest similar nutritional and socio-economic status.

Table II: Pulmonary function parameters of both control and study groups

Parameters	Control group (n=30)	Study group (n=30)	P-value
FVC (L)	2.90+0.53	2.63+0.40	0.03*
FEV1 (%)	84.97+13.89	67.61+16.85	0.000***
PEFR (L/min)	506.00+34.07	488.66+27.89	0.610

*P<0.05- significant; ***P<0.001-very highly significant.

Table II shows comparison of pulmonary function tests in control and study group. The results show variations in the lung parameters (FVC, FEV1(%), and PEFR) among the traffic exposed shopkeepers and residential shopkeepers. FVC and FEV1(%) of traffic exposed shopkeepers are found to be significantly lesser when compared to residential shopkeepers. These observations indicate possibility of obstructive lung disorders in case of shop keepers exposed to traffic pollution.

Discussion

Our observations of significant reduction of FVC and FEV1(%) and insignificant reduction of PEFR in road side shopkeepers exposed to traffic pollution were very much corroborated with observations of Ingle and Wagh in their study on shopkeepers working near national highway in Jalgaon [5] .

Ingle et. al. (2005)[7] reported decrease in lung efficiency in the shopkeepers exposed to traffic pollution. Significant reduction in the lung capacity was observed in the higher age group of residential people living along the highway roadside. The forced expiratory volume in one-second (FEV1) and peak expiratory flow rate (PEFR) of exposed residential population was significantly affected as compared to control.

Jeelani*et al.* (1992)[8] reported reduced PEFR in the Kashmiri population than healthy western population due to anthropogenic, environmental, genetic and socioeconomic factors. This study concludes that the traffic policemen are highly vulnerable for respiratory impairment due to vehicular exhaust at workplace environment.

Emissions from road transport are the primary source of health hazardous pollutants, such as nitrogen oxides and carbon monoxide, and a significant source for fine particulate pollution. Exposures to these emissions are typically non voluntary and represent serious risk to human health.[9]

Decrease of FVC and FEVI (%) in our study group indicates possible lungs and airway inflammation by automobile emissions. Diesel exhaust particles (DEP) emitted from automobiles capable to adsorbed organic hydrocarbons thought to consist of a carbon core surrounded by trace metals, such as nickel, and its salts. A number of these components have shown inflammatory effects in the lungs of laboratory animals [10, 11].

Conclusion

The results of the study indicate reduction in the lung function efficiency among the shopkeepers exposed to higher traffic pollution. The forced expiratory volume in one-second (FEV1) and Forced Vital Capacity (FVC) of exposed residential population was significantly affected as compared to control group who are residing away from higher traffic pollution.

Emphasis has to put on preventive aspects rather than on diagnosis and management of respiratory diseases. Hence protective mask wearing and reduction in timing of work shifts will help in reducing the exposure to air pollutants.

Conflicts of Interest: Nil

Limitation: Detailed information on air pollutants of the study area would have helped to understand the issue better.

Acknowledgement: The authors are thankful to Indian Council of Medical Research (ICMR), New Delhi for financial assistance.

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