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Prevalence of restrictive changes in lungs due to air pollution in traffic police of Navsari: A cross sectional study

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Abstract

Background and purpose: The Respiratory system bears the direct brunt of pollutants in the inhaled air. The lungs are vulnerable due to their large surface area exposed to ventilation, thin respiratory membranes, and massive quantity of pulmonary blood flow. Inhalation of toxic substances in the inspired air can result in injury to airways including the terminal bronchioles, leading to acute and chronic respiratory diseases, exhibiting as a decrease in lung function.

Method: The present study was conducted in Navsari, Gujarat. The study includes 158 traffic police who continuously exposed to automobile exhausts. The study was conducted over period of 6 months. Work experience of more than one year was required as inclusion criteria. Both male & female participated in this study.

Results: The study was done among 158 traffic police personnel who have worked in Navsari city; from this 134 traffic police were included in our study according to inclusion and exclusion criteria. From this 134 policemen 73.8% male and 26.12% female Spirometry was done in all traffic police men, PFT result revealed 7% normal pattern, 55% restrictive pattern, 37% obstructive pattern.

Conclusion: Present study was done at Navsari city among traffic police personnel to assess lung function; and we concluded that 55% of traffic police are suffering from restrictive lung disease, 37% obstructive and 7% normal. Which shows that they are more prone to have a restrictive lung disease. Spirometry was a good tool to assess lung function showing that air pollutants have a deleterious effect on lung function. So various recommendations were suggested to increase the lung age of traffic police personnel of Navsari city.

Keywords: PFT, traffic police, Navsari, air pollution

Introduction

The Respiratory System bears the direct brunt of pollutants in the inhaled air. The lungs are vulnerable due to their large surface area exposed to ventilation, thin respiratory membranes, and massive quantity of pulmonary blood flow. Inhalation of toxic substances in the inspired air can result in injury to airways including the terminal bronchioles, leading to acute and chronic respiratory diseases, exhibiting as a decrease in lung function^[14].

It is estimated that, globally, 9 out of 10 people dwelling in urban areas are expected to air pollution from PM_{2.5} (i.e. particulate matter 2.5 micrometer in diameter) levels that are above the annual mean WHO air quality guideline levels of urban PM_{2.5} concentration being in the WHO South East Asia Region (57.3. microgram/meter³)^[11].

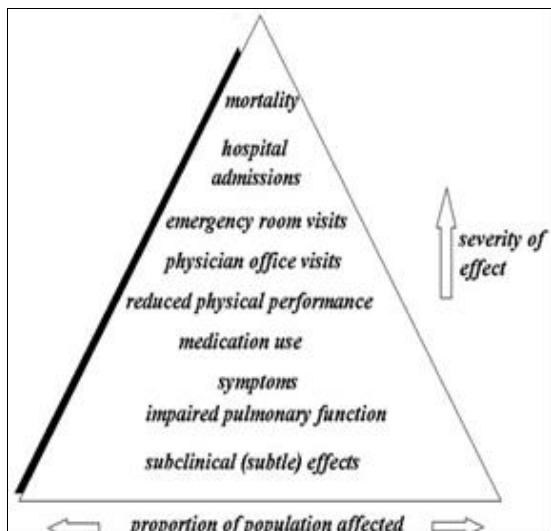


Fig 1: Pyramid of health effect

Air pollution has an effect on both respiratory as well as cardiac systems. The health effects of air pollution can be viewed as a pyramid with the mildest effect at the bottom and severe effect at the top of the pyramid. It is evident from the pyramid that as the severity of effect decreases, the number of people who gets affected out of air pollution increases [15]. (fig.1)

With unprecedented increasing the density of automobile vehicles all over the globe, automobile exhaust related air pollution have become a major health hazard. Inhalation of fuel vapor along with dust may lead to significant impairments of lung and other body function, duration of exposure, aging, concurrent, smoking may influence the pulmonary function in this populations [4].

Present study was aimed at measurement of lung volumes and capacities in traffic police personnel posted at various traffic junctions in Navsari region.

Methodology

The study was done at Navsari city. All positive consent cases (100, Male-73.8% and Female-26.12%) aged 20 - 40 years were included. All preliminary details were recorded. Structured interview and detailed clinical examination was done in small groups. Information about their duty hours, duty place and service length were recorded. Addiction pattern and their medical illness information were recorded. The data was analyzed using Microsoft excel version (2007) and SPSS 26.

Inclusion and exclusion criteria

We included traffic police personnel working at traffic signals, nonsmoker, aged 20-40 years, with minimum 1 year of job and ready to give written informed consent.

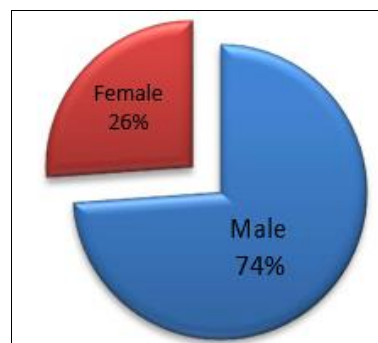
We excluded traffic police personnel working at office, having presence of any active lung disease, history of hyper tension, diabetes mellitus, asthma or systemic disease, smoker, BMI more than 26.

Results

The study was done among 158 traffic police personnel who have worked in Navsari city from this 134 traffic police were included in our study according to inclusion and exclusion criteria. From these 134 policemen 73.8% are male and 26.12% are female. Spirometry was done in all traffic police personnel, PFT result revealed 7% normal pattern, 55% restrictive pattern.

Table 1: Distribution according to gender

Gender	Total No.	Percentage
Male	99	73.8%
female	35	26.12%

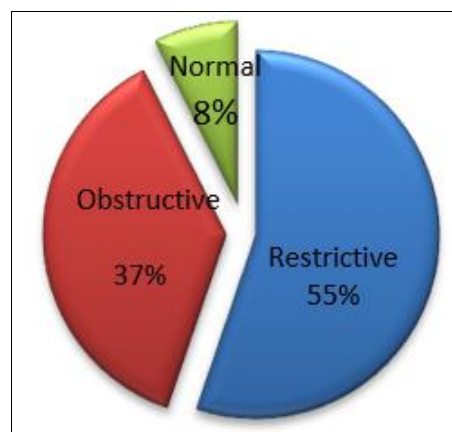


Graph 1: Distribution according to gender

Above table & graph shows that from 134 sample 99(73.8%) were male and 35(26.12%) were female.

Table 2: Distribution according to types of changes seen in lungs

Type of changes in lungs	Total subject no	Percentages
Restrictive	74	55.22%
Obstructive	50	37.31%
Normal	10	7.46%

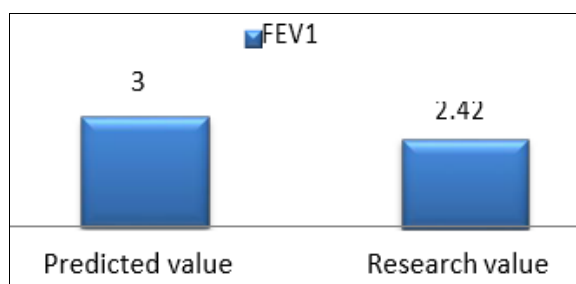


Graph 2: Distribution according to types of changes seen in lungs

Above table and graph shows that from 134 samples, 74 samples have Restrictive type of lung changes, 50 samples have obstructive type of lung changes, 10 samples have Normal lung functions.

Table 3: Values of FEV1

value	Fev1
Predicted value	3
Research value	2.42

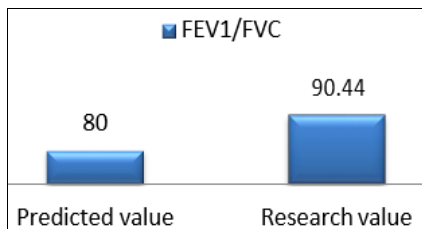


Graph 3: Values of fev1

Above table and graph shows the Predicted value and mean Research value of FEV1 i.e. 3 and 2.42 which is less and indicated most population that traffic police are more prone to develop restrictive type of lung changes.

Table 4: Values of FEV1/FVC ratio

Values	FEV1/FVC
Predicted value	80
Research value	90.44

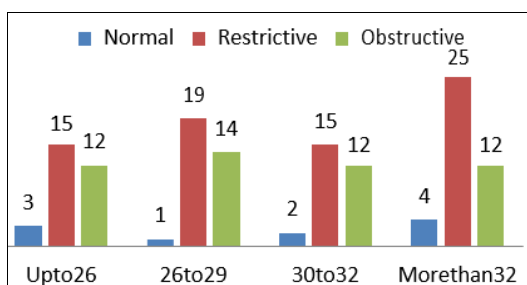


Graph 4: Values of fev1/FVC ratio

Above table and graph shows the Predicted value and mean Research value of FEV1/FVC i.e. 80 and 90.44 which is more and indicated most population that traffic police are more prone to develop restrictive type of lung changes.

Table 5: Effect of age on restrictiveness

Age	normal	restrictive	obstructive	Total
Up to 26	3	15	12	30
26 to 29	1	19	14	34
30 to 32	2	15	12	29
More then 32	4	23	12	41

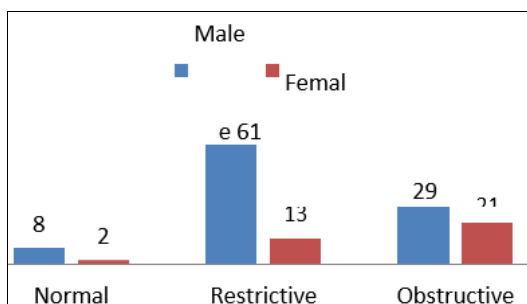


Graph 5: Effect of age on restrictiveness

Above table and graph shows that the chances of restrictive disease are more in any age due to air pollution and as age increases there is rise in no. of cases.

Table 6: Effect of gender on restrictiveness

Gender	Normal	Restrictive	Obstructive	Total
Male	8	61	29	98
Female	2	13	21	36
Total	10	74	50	134

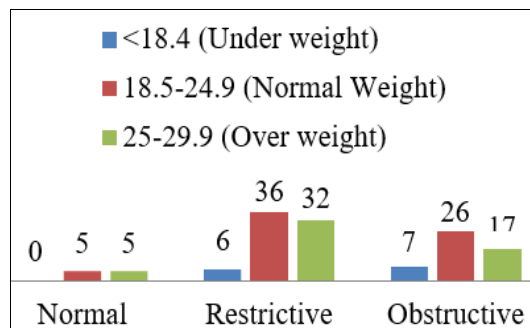


Graph 6: Effect of gender on restrictiveness

Above graph shows that according to gender wise both are equally and more prone to develop restrictive disease.

Table 7: Effect of BMI on Restrictiveness

BMI	Normal	Restrictive	Obstructive	Total
<18.4 (Under weight)	0	6	7	12
18.5-24.9 (Normal Weight)	5	36	26	67
25-29.9 (Over weight)	5	32	17	54
Total	10	74	50	134



Graph 7: Effect of BMI on restrictiveness

Above table and graph shows the chances of restrictive lung disease is more in under and overweight persons.

Discussion

The current study was conducted to find prevalence of restrictive changes in lungs due to air pollution in traffic police of Navsari – a cross sectional study.

The result of this study shows that pulmonary function test by computerized spirometer can assess the respiratory function and give a fair idea about the respiratory health of an exposed population. Therefore, these changes can observe in early stages.

In modern era air pollution became a burning problem. Vehicular exhausts are polluting the atmosphere and produce deleterious effect on respiratory system. Road traffic and vehicles produce volatile organic compounds, suspended particulate matter, oxides of sulfur, oxides of nitrogen, and carbon monoxide which can adversely affect the respiratory system in exposed population. Traffic related air pollution is an occupational health hazard to individuals who work close to traffic. Traffic police personnel are more prone to develop health hazards of respiratory system. The prevalence of the obstructive, restrictive and mixed type of functional impairment of the lung has been found to have direct relationship with the dust concentration and duration of exposure Prolonged exposure to dust can result in chronic bronchial problem [1].

Various PFT studies have done in India (Bangalore, Kochi, Jammu, Hyderabad, Pondicherry etc.) in traffic police. This study was carried out, to assess the lung function of traffic policemen of Navsari city.

Navsari is the 25th “cleanest city of India” according to the Indian ministry of urban development. Navsari is also a famous place to the great Satyagraha march led by Mahatma Gandhi till the Dandi.

Navsari district covers a geographical area of 2246 sq. km with 6 talukas viz. Navsari, Jalalpore, Gandevi, Chikhli, Vansda, & Khergam.

The study group consisted of 35 females and 99 males, constituting 158 of the total police personnel studied.

The study was done among 158 traffic police personnel who have worked in Navsari city, from this 134 traffic police were

included in our study according to inclusion and exclusion criteria.

From this 134 policemen 73.8% male and 26.12% female Spirometry was done in all traffic police men, PFT result revealed 7% normal pattern, 55% restrictive pattern, 37% obstructive pattern.

Restrictive pattern PFT results are due to continuously exposure of lung to air pollutants. This causes constant inflammation of airways and lung parenchyma which leads to excessive secretion and some degree of pulmonary fibrosis.

Dr. Mahendra Kumar Bharti *et al.* conducted study on "Effects of air pollutants on lung function of traffic policemen of Ujjain, Madhya Pradesh, India." in this study author concluded that air pollutants can cause deleterious effect on lung function. This study includes 100 traffic policemen 98% were male and 2% female. Duty place roadside-90% and office 10%. Daily exposures 63% were 6 hours. Service length- 79 percent had 10 years or more periods. Spirometry results were pretty duty 60 percent normal 33 percent restrictive 4 percent obstructive and 3 mixed ^[1].

Amit H Makwana *et al.* study revealed computerized spirometry-based evaluation of pulmonary functions of traffic policemen in two groups. Results revealed declined lung function ^[2].

Conclusion

Present study was done at Navsari city among traffic police personnel to assess lung function; and we concluded that 55% of traffic police are suffering from restrictive lung disease, 37% obstructive and 7% normal. Which shows that they are more prone to have a restrictive lung disease. Spirometry was a good tool to assess lung function showing that air pollutants have a deleterious effect on lung function. So various recommendations were suggested to increase the lung age of traffic police personnel of Navsari city

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