Original Research Article

ASSESSMENT OF LUNG FUNCTION TEST ON STREET VENDORS OF CHENNAI REGION

Running Title : Lung function test on street vendors.

ABSTRACT

INTRODUCTION: Street vendors are the most dominant occupation in urban and rural areas. Street vendors are exposed to several environmental pollution. They inhale toxic compounds such as carbon monoxide, carbon dioxide, ozone, nitrogen dioxide and other volatile organic chemicals. This is due to emission from vehicles and traffic. The aim of the study is to assess lung function on street vendors of the Chennai region.

MATERIALS AND METHODS: The study is done among street vendors in chennai region. The study included 50 people where 25 people are from the exposed group and 25 people are from the normal group. It was conducted by using a computerised spirometer. The total air capacity of the lung. The data was collected and entered in SPSS software. The results were obtained by doing an independent sample T test.

RESULT AND DISCUSSION: Parameters like FVC, FEV1, PEF, FEV1/FVC were used to assess the lung function. It was observed that there is a decline in pulmonary functions parameters of the street vendors and it was not statistically significant .

CONCLUSION: Thus the effect of pollution by the vehicles may be responsible for the pulmonary function impairment on street vendors affecting their lungs and other organs. This can be prevented by using face masks, lifestyle modification etc.

KEYWORDS: Street vendors, spirometer, toxic compounds, parameters, Innovative technique

INTRODUCTION

In all the developing countries and rural areas, street vendors are the most dominant occupation . Street vendors are found everywhere and exposed to pollutants for their daily survival (1). Most of the street vendors are found on commercial streets where there is a high effect of pollution . Due to the development in the industries there is a high increase in environmental pollution and vehicular traffic. The vendors are exposed to pollutants like carbon monoxide, carbon dioxide, nitrogen dioxide, ozone and other volatile organic chemicals leading to severe respiratory disorders. Most of the pollution in urban areas is due to emission from diesel powered vehicles and traffic. The vendors are exposed to pollution which causes a major impact on the organs and system of the body (4). It causes major lung disease, cardiovascular disease, ischemic heart disease and also bronchitis, asthma, headache, sore eyes etc (5).

Street vendors intake high amounts of toxic compounds which affect their lung capacity. The different parameters which are being used are forced vital capacity(FVC), forced expiratory volume(FEV), Peak expiratory flow rate(PEF) and FEV1/FVC (6). The decrease in the air quality due to vehicular emission leads to significant mortality and morbidity by affecting multiple organs and the human system (7). The lungs are vulnerable to such pollutants as there are large surface areas, thin respiratory areas and large quantities of pulmonary blood flow. The pollutants cause reduced lung function, cardiac problems, lung cancer and COPD (8). Inhalation of toxic compounds can result in the injury to the airways and bronchitis which leads to acute and chronic respiratory diseases resulting in decreased lung function (9)

In India, the street vendors act was enacted in 2014 which said protection of livelihood and regulation of street vendors. Any health related perspective was not covered under this act for the vendor. Lung function tests vary differently which results in suggesting and is governed by genetic, environmental and nutritional factors which can help physicians to decide and diagnose the treatment of lung disease (10). Outdoor air quality is an important determinant of a healthy individual . It is estimated that outdoor air pollution caused an increase of 3.7 million deaths.

The main aim of the study is to evaluate the lung function between the exposed group(street vendors) and control group in the Chennai region. This study will also be aware of the exposure of the vendors that they are being exposed to as there is a rapid increase in the pollution level. Our team has extensive knowledge and research experience that has translated into high quality publications(11–13)(14–19),(20)(21),(22)(23),(24)(25)(26–30). The study aims to evaluate the extent of impairment in lung function in street vendors compared to the general population.

MATERIALS AND METHODS :

This study was conducted in the Chennai region. The study population included 50 people of age group 20 - 50 yrs, of which 25 people are from the exposed group and other 25 people are from the control group. (Sampling size calculation formula and reference(s))

PARTICIPANTS: Street vendors of chennai region, control group – (apparently) normal healthy individuals.

INCLUSION CRITERIA:

The street vendors who have minimum work experience for 5 years. (consecutively dwelled in Chennai region for --- years)

The street vendors who work minimum for 5 hours per day.

To control normal healthy individuals between the age group 20 to 50.

EXCLUSION CRITERIA:

Vendors with not less than 5 years of work experience

The population with COPD, smoker, alcoholic, asthmatic, cardiovascular disorder, and tobacco were excluded.

STATISTICAL ANALYSIS: the data was collected and entered in SPSS software and t test was done along with bar graphs.

RESULTS:

The parameters used for determining the lung function for street vendors are FVC, FEV1, PEF and FEV1/FVC for the analysis for both control group and exposed group. In (FIG 1) the mean value for FVC for the controlled group is 2.38 and for the exposed group it is 1.88. As the street vendors are exposed to high pollution, it leads to the decline in FVC. Even Though the mean value of the exposed group was low, it was statistically not significant ($P>0.05$). In (FIG 2) the

mean value for FEV1 for the controlled group is 2.01 and for the exposed group it is 1.71. The mean value for the exposed group is less than the controlled group. So, there was a decrease in lung function of the exposed people ($p>0.05$). but it was statistically not significant. In (FIG 3) the mean value for PEF for the exposed group is 2.82 and for the controlled group it is 3.37 which is low. The PEF for the exposed group is lower than the controlled group ($P>0.05$). So it is statistically not significant. In (FIG 4) the mean value for FEV1/FVC for the exposed group is 86.97 and for the controlled group it is 87.23. The mean value for exposed people is decreased when compared to normal people ($P>0.05$). It is not statistically significant. The (TABLE1) shows the significance between the exposed group and normal group. It is not statistically significant in any case.

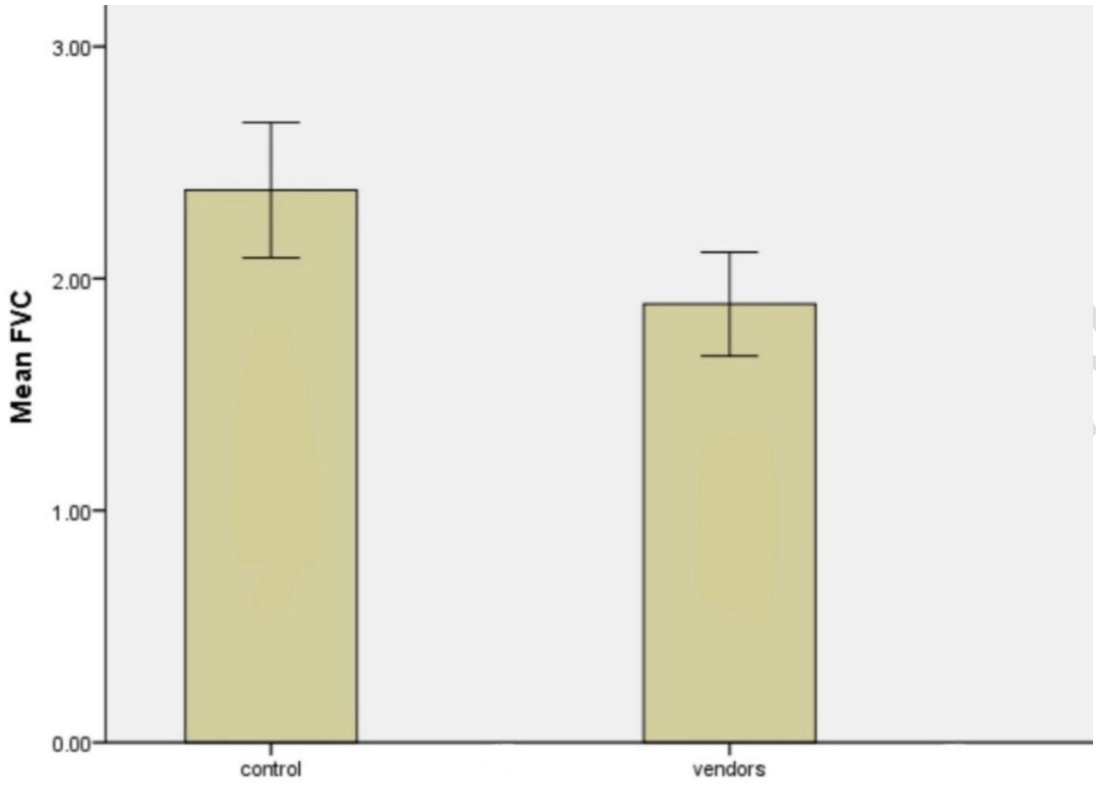

FIG 1 : Shows the forced vital capacity (FVC) of control and exposed group. The X axis represents the controlled and the exposed group and the Y axis represents the mean FVC value. The Exposed group has lesser FVC value compared to the control group. An independent T test was done and the p value was found to be 0.108 (P>0.05) which is statistically not significant.

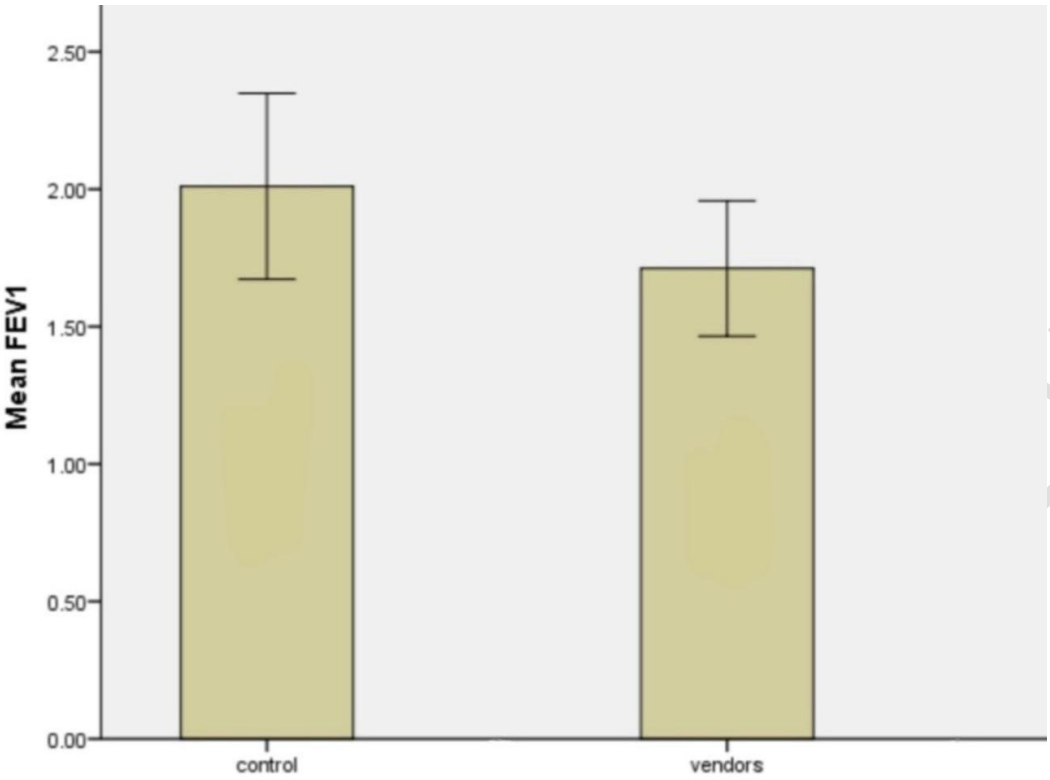

FIG 2 : Shows the forced expiratory volume of control and exposed group.The X axis represents the controlled and the exposed group and the Y axis represents the mean FEV1 value. The Exposed group has lesser FVC value compared to the control group. An independent T test was done and the p value was found to be 0.119 (P>0.05) which is statistically not significant.

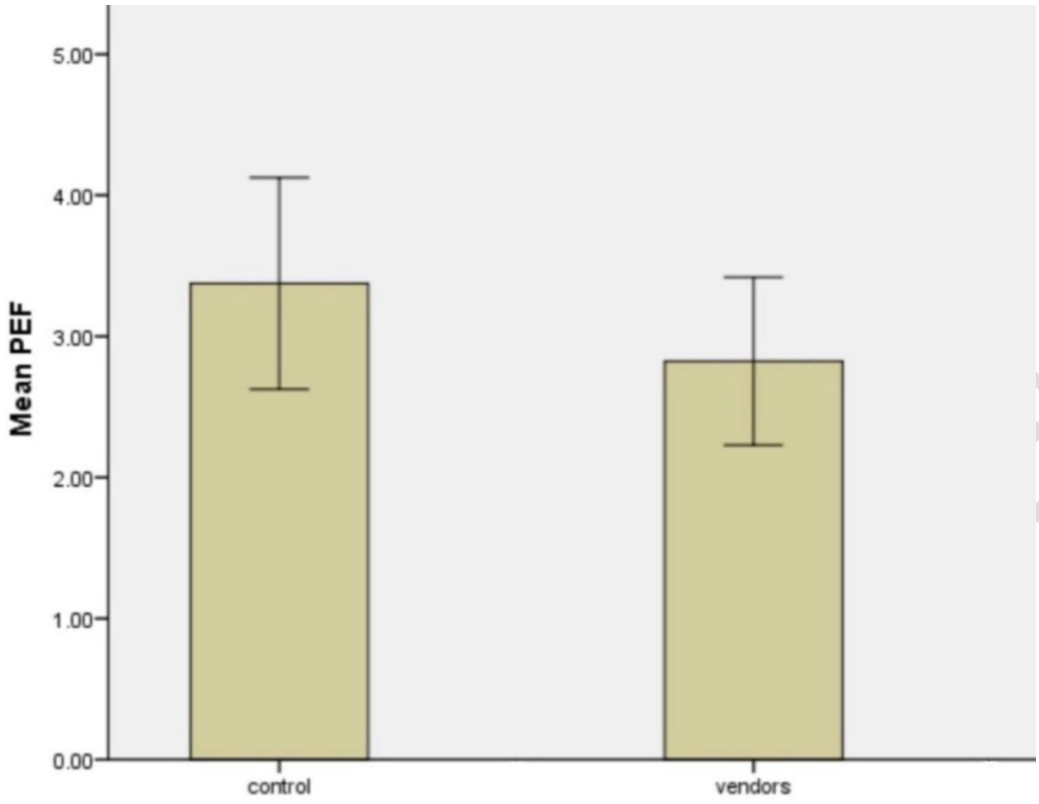

FIG 3 : This graph shows the peak expiratory flow rate (PEF) of the control and exposed group. The X axis represents the controlled and the exposed group and the Y axis represents the mean PEF value. The Exposed group has lesser FVC value compared to the control group. An independent T test was done and the p value was found to be 0.288 (P>0.05) which is statistically not significant.

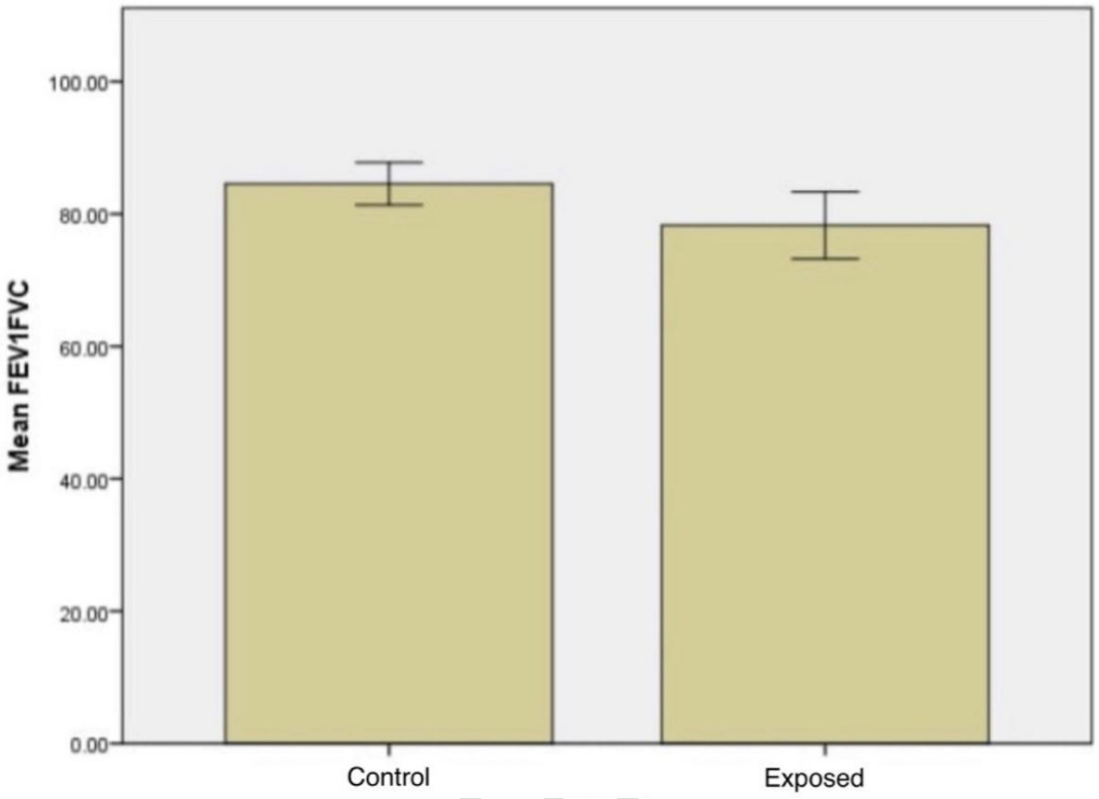

FIG 4 : This graph shows the FEV1/FVC value of control and exposed group.The X axis represents the controlled and the exposed group and the Y axis represents the mean FEV1/FVC value. The Exposed group has lesser FEV1/FVC value compared to the control group. An independent T test was done and the p value was found to be 3.09 which is statistically not significant.

Table 1: shows the significance in the exposed group and control group. It is not statistically significant in any case.

PARAMETERS	CONTROL GROUP	EXPOSED GROUP	P VALUE	SIGNIFICANCE
FVC	2.38±0.706	1.88±0.54	0.108	Not significant
PEF	3.37±1.81	2.82±1.44	0.288	Not significant
FEV1	2.01±0.82	1.71±0.59	0.119	Not significant
FEV1/FVC	87.23±18.46	86.97±15.45	3.09	Not significant

(Vendors in the same area should be sub-grouped and/or vendors close to each others should be sub-grouped and compared in both groups.)

DISCUSSION:

The present study is designed to look for the differences in the respiratory function between the street vendors and the normal people. The street vendors are taken as an exposed group with long term exposure to air pollution.

From the study, it has been found that the street vendors are exposed to environmental pollutants and though it is not statistically significant, the lung function is lowered in the exposed group when compared to normal people. The chronic irritation caused by pollutants induce inflammatory responses associated with reduced lung function (31). The street vendors are exposed to exhaust from motor vehicles along with other pollutants existing on the road. Exposure to pollutants has been associated with an increase in respiratory symptoms and decrease in lung function. The source of air pollution in urban areas is due to power plants, automobiles and industries (32).

Forced Vital Capacity(FVC) is the amount of air which is forcibly exhaled from the lungs after the deepest inhalation. From our study it was found that the mean value of FVC for the

controlled group is higher than the exposed group. There is a decline in FVC for the street vendors. In a study conducted by (33) it was stated that the mean FVC value for exposed groups is lesser than the controlled group. In another study done by (34) the mean FVC was found to be the lesser for exposed groups. In our study the mean FVC value was less when compared to above studies. There is a decline in FVC value as street vendors are exposed to high intake of pollution which decreases their lung capacity (22).

Forced Expiratory volume in 1st second (FEV1) is the amount of air exhaled in the first second of the total expiratory time(35). From our study it was found that FEV1 value for exposed groups is less than control groups. In a study conducted by (33) it was observed that FEV1 value for exposed groups is less than control group land. In the other study done by (34) it was found that the FEV1 was less for exposed groups. In our study it was found that the FEV1 value is less when compared to other studies. (36) The decrease in FEV1 value is due to industrial pollution, vehicular emission which play a vital role in the decline of FEV1. (3)

Peak Expiratory Flow rate (PEF) is the maximal speed during forced expiration. When compared to other studies done by (33) the mean PEF value for the exposed group was less when compared to the control group. In our study the PEF value was less when compared to other studies. There is an abnormal PEF value in our study. (16) Age, height and weight can be the main factors which lead to a decline in PEF. (29)

FEV1/FVC ratio is the measurement of the amount of air forcefully exhaled from the lungs. From our study it was found that the mean value of FEV1/FVC for exposed groups is less than the control group.(19) It is clearly understood that the significant value was decreased in the exposed group compared with the control group. (37)

A similar study done in the Telangana region also documents the decrease in pulmonary function of the street vendors and the effect of pollution by vehicular emissions (38). There is a negative correlation when compared to the pulmonary function test parameters among the street vendors with the duration of their exposure (27). The decline in the lung function parameters may be due to the large number of pollutants like carbon monoxide, sulphur dioxide, ozone and other volatile

organic compounds (39). These pollutants affect the lungs resulting in oxidative stress which can contribute to fibrotic lung diseases, chronic bronchitis, emphysema and lung cancer (40). As the street vendors are exposed to pollution for a long time the toxic chemicals and gases of vehicular emission produce irritation and allergies in the lungs and the airways (41). The street vendors are particularly prone to occupational hazards (42). The vehicular exhaust particularly from diesel exhaust induces reactive oxygen species in macrophages and bronchial epithelial cells which is targeted by the particular matter in the lung (43).

We observed that the value of FVC, FEV1, PEF, FEV1/FVC were reduced in street vendors as compared to the normal group. The street vendors are at high risk of obstructive and restrictive lung disease. (44)Some preventive measures should be taken for the street vendors as they are exposed to high pollution.(45) This study was done within a small population which is the limitation of the study and the future scope of the study is to be conducted in other regions.

CONCLUSION

Within the limitations of the study it was found that there is a decline in pulmonary function parameters in street vendors. Early detection, education awareness programs, wearing face masks, lifestyle modification and regular lung function tests can help them to avoid developing lung diseases.

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