

# Evaluation of Lung Function in Automobile Diesel Mechanics in A Semi Urban Town of South India- Kumbakonam Urban Rural Epidemiological Study – KURES 6

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## Abstract

Automobile mechanics are constantly exposed to dust from the exhausts of petrol and diesel. We recruited 50 petrol two wheeler mechanics and subjected them to lung function tests. All were non-smokers without any respiratory symptoms. All mechanics were regular workers with a minimum of three years and at least an exposure of 5 hours of more per day. They were explained about the methodology and asked to attempt three times and the best of three were selected. The incidence of obstructive lung disease (FEV1/FVC < 70%) was only 2%. But the incidence of reduction of effort independent MEF 25- 75 in a significant manner is around 38% which coincided with reduction in PEFR values. [FEV1 = Forced expiratory volume in 1 second. PEFR = peak expiratory flow rate. MEF ( 25-75) = mean forced expiratory flow between the 25% and 75% of the FVC.] We did not find any correlation with body mass index. We did not resort to analyses of deterioration of lung function with differing exposure years with a low sample size. We suggest that a regular PEFR with practice of established preventive measures may prevent the progress from asymptomatic illness to a symptomatic stage in such health workers.

**Keywords:** Spirometry, lung function, automobile, mechanics.

## Introduction

Automobile repair workers of the informal sector are frequently exposed to dusts, chemicals and toxic substances which are harmful to their health. The small auto-body repair workshop is actually an industry in which workers are exposed to hazardous amounts of airborne contaminants. Auto mechanics have risks of inhalational lung injury from both fine and particulate matters, gasoline, petroleum products and many other hydrocarbons<sup>1</sup>. Chattopadhyaya <sup>2</sup>has reported an incidence of 25 % obstructive lesions and 21 % restrictive lesions on automobile mechanics. Hence with such a high incidence of abnormalities in lung function tests in the background, we wished to find out the incidence of such defects in our semi urban town of India.

## Methods

This observational epidemiological study of lung function among automobile petrol/diesel mechanics

was done in a semi urban town of South India in March-2019. After approval from the ethics committee (IRBSTH-103/2019), automobile especially two wheeler mechanics working in the small town were enumerated. Among these mechanics, regular workers with a minimum of three years and at least an exposure of 5 hours of more per day were selected. This number was based from an experience from the auto mobile engineer rather any scientific background as there were no earlier clear-cut demarcations regarding this exposure limits in earlier studies. Around sixty seven such persons were spotted out of which seventeen did not give consent for the study. Hence we did pulmonary function tests for all the fifty mechanics who fit into the category of three years and five hours. The study did not include road side mechanics. All the mechanics were studied with --Spirolab-III, a calibrated spirometer with built in computer program; they were explained about the equipment and then the procedure of doing

the test. All the mechanics were given three chances to use and the best test was taken for the study. The study variables were Forced Expiratory Volume in 1 second (FEV1), Forced Vital Capacity (FVC), Peak Expiratory Flow Rate (PEFR), FEF 25-75, age, smoking habit, duration of work, years of experience, and any respiratory symptoms. Considering the literacy of mechanics, the reference values being for non-Indians, we considered a FEV1/FVC % of less than 70 % was significant for obstructive lung disease. Any FVC less than 70% was considered restrictive. We took 70 % as the value to detect any milder form of obstruction in such asymptomatic cases. The incidence of combined diseases was also noted. With such less sample size, we did not resort to sub classifying the same with duration of exposure and lung function. All data were fed into computer and SPSS version 20 was used. Any untoward event was recorded.

**Results**

Out of the seventy people who fulfilled the inclusion criteria, only, fifty mechanics were willing to undergo the study. The demographic data is tabled in Table 1.

	Mean ± Std.Deviation
Age (years)	37.44 ± 11.4
Weight (kilograms)	65.54 ± 13.69
Height (cm)	155.06 ±11.07
BMI	27.27 ±5.18

All the fifty mechanics were non-smokers without any history of wheezing or allergic bronchitis. The mean years of exposure to dust were 10.46±5.22. The mean hours of exposure per day were 6.38±0.67 hours. The details of lung function among the mechanics are tabled below.

**Table 2 showing the pulmonary function test values: (mean±SD)**

FVC (litres)	3.48± 0.88
FVC % of predicted	109.3±32.2
FEV1 %	89.22±13.95
FEV1/FVC %	74.83±11.95
PEFR	233.22±89.89
MEF(25-75) litres	2.37±1.03
MEF %	77.06±35.05

FVC = forced vital capacity

FEV1 = Forced expiratory volume in 1 second

PEFR = peak expiratory flow rate.

MEF ( 25-75) = mean forced expiratory flow between the 25% and 75% of the FVC

From the gross data, it can be easily assumed that there is no gross dysfunction in volumes of mechanics. The values were near normal in majority of mechanics. There was only patient who showed a FEV1/FVC percentage of 66% and hence deemed as obstructive. There was neither a single case of restrictive lesion or combined lesion. The mean PEFR was 233 litres which was less than the expected. Nineteen out of fifty patients had an MEF 25-75 value of less than 70 %. Out of the 19 patients 11 had a value of less than 50%. As such there was no awareness about exposure and lung function in any of the mechanics.

**Discussion**

Automobile repair mechanics are engaged in a variety of activities which include mechanical work, body repair and reconstruction, re-treading of tyres, spray painting and repair of battery. This work routine exposes them to various occupational health hazards and dangers. In a study of 151 automobile male workers earlier, obstructive impairment was noticed in 25.83% of the workers while restrictive impairment was in 21.19% of the workers. Mixed disease was seen in 10.6% of the workers. The study included smokers and nonsmokers.<sup>2</sup> The incidence in our study was very less compared to them; they have also differentiated the mechanics with age and found out the differences. As such we have not done such comparison. We have found only one case which corresponds to a 2% incidence of obstructive lesion. In a study by Krishnakumar<sup>3</sup> et al, 56.7% of workers had some form of defective pulmonary function. Smoking, increased duration of working hours and years of work showed significant pulmonary impairment. But our incidence is very low. In a few Nigerian studies<sup>4,5</sup>, the authors have claimed a reduction of FVC and FEV1 even with five years of exposure. The PEFR was not significantly changed in their study. Dahlquist et al<sup>6</sup> have found out a significant reduction of lung function in mechanics especially exposed to asbestos. As they have found a reduction in major components of pulmonary function tests, they have not looked into the details of MEF 25 even though those values were also decreased. In our case there was a significant reduction of MEF-25-75 up to 38% of cases. The basic difference is that all our

cases were non-smokers and there were no confounding variables as such like any other irritant exposure. Alex et al<sup>7</sup> have also demonstrated a decreased lung function among petroleum product workers. They had a 50 % incidence of lung symptoms. In our study there was no symptom in any of the cases. There were nineteen cases of a significant decrease in the MEF 25-75 values. In these patients we had a significant reduction of PEFR of less than 250 litres. Hence in our study, the PEFR and MEF 25-75 values coincided and a reduction was found in both values. Our study was restricted to asymptomatic two wheeler mechanics and hence the sample size was low. Parker<sup>8</sup> et al had described an incidence of 25 % of obstructive lung diseases in automobile workers. In the same study, they had only FEV1/FVC ratio as a marker of obstruction as a fiftieth percentile. There was no mention about MEF 25-75. Marseglia GL<sup>8</sup> et al have described that MEF 25-75 is early marker of pulmonary dysfunction especially allergic bronchitis. Hence in our case study, we have found out the values of MEF 25-75 were significantly decreased. The limitations of our study were the sample size and absence of age, weight matched controls in the same population. The major new finding which we have found in our study is the reduction of MEF 25-75 which is an effort independent lung function being affected in our cases. Hence by virtue of age, physical exercise and motivation, the performance of FEV1/FVC may be altered while MEF 25-75 can't be changed by effort<sup>9</sup>. We had also found that PEFR correlated with MEF 25-75 values. In only one study by Anupama et al<sup>10</sup>, they have noted FEF25-75 and found a decrease in 8.57 % which is far less than our results. In our study the average BMI was around 27. There were only three cases of BMI more than 35 all of which showed decrease in PEFR and MEF 25-75 but the FEV1 were normal in these cases. Hence we deduced that the BMI is not affecting the results of our study even though we can't comment with authority as the sample size was low. We planned to take up both petrol and diesel vehicles, but we could muster mechanics with exposure to petrol exhausts only. The exposure to such exhausts alone and decreased lung function has not been studied earlier.

### Conclusion

The awareness about allergen exposure and lung function is absent among mechanics. The incidence of obstructive lung disease (FEV1/FVC reduction below 70%) in automobile mechanics is only 2 %. But there was a significant decrease in an effort independent

function (i.e MEF25-75) in 38% of cases, which is an early sign of allergen exposure. The PEFR values coincided with reduction of MEF 25-75 values. We suggest that a routine PEFR testing can be done in such workers and protective measures can be taken to prevent the progress to a significant symptomatic deterioration of lung function in automobile mechanics.

Dr MRS Collected the data, Dr SPS conceptualized and Dr MH did the write up

**Conflict of Interest** – Nil

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### References

1. Thangaraj S, Shireen N. Occupational health hazards among automobile mechanics working in an urban area of Bangalore – a cross sectional study. *Int J Med Sci Public Health*. 2017;6:18-22.
2. Chattopadhyay O. Pulmonary function in automobile repair workers. *Indian J Community Med*. 2007;32(1):40-3.
3. Krishna Kumar MK, George LS. Pulmonary function of automobile repair workers in the informal sector of Raichur urban. *Int J Community Med Public Health* 2017;4:1510-4.
4. Omokhodion FO. Environmental hazards of automobile mechanics in Ibadan, Nigeria. *West Afr J Med* 1999; 18(1): 69-72.
5. Akintunde AA, Oloyede TO, Salawu AA Lung functions abnormalities among auto mechanics in Ogbomoso, Nigeria: Clinical correlates and determinants. *Annals of Health Research* (4), 2: 120-130.
6. Monica Dahlgvist, Rolf Alexandersson and Goran Hedenstierna. Lung Function and Exposure to Asbestos Among Vehicle Mechanics, *American Journal of Industrial Medicine* 1992: 22; 59-68
7. Reginald G. Alex, Anand Alwan et al. A study on morbidity among automobile service and repair workers in an urban area of South India. *Indian Journal of Occupational and Environmental Medicine*, 2014: 18, (1), 9-12
8. Parker DL, Waller K, Himrich B, Martinez A, Martin F. A cross-sectional study of pulmonary function in autobody repair workers. *Am J Public Health*. 1991;81(6):768-71.

8. Marseglia GL, Cirillo I, Vizzaccaro A, Klersy C, Tosca MA, La Rosa M et al. Role of forced expiratory flow at 25-75% as an early marker of small airways impairment in subjects with allergic rhinitis. *Allergy Asthma Proc.* 2007 (1):74-8.
9. Rodrigues Marcelo Tadday, Fiterman-Molinari Daniel, Barreto Sérgio Saldanha Menna, Fiterman Jussara. The role of the FEF50%/0.5FVC ratio in the diagnosis of obstructive lung diseases. *J. bras. pneumol.* [Internet]. 2010 Feb [cited 2019 Apr 06]; 36( 1 ): 44-50.
- 10 Anupama N Sonu Ajmani, Vishnu Sharma M, , Ganaraja B, Subbalakshmi N K, , Bhagyalakshmi K, Shiela R Pai. Analysis of dynamic pulmonary function in automobile mechanics *IJBR* 2012: (2) 374-7