# Respiratory Evidence for Health Risks from Inhaled Car Exhaust in Traffic Policemen in Khartoum State

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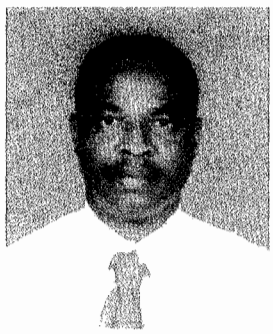

**Abstract:**

**The objective:** of this study is to evaluate the effect of exposure to car emission on respiratory parameters in traffic policemen working in Khartoum state (Khartoum South, Khartoum North and Omdurman) during the period from 21st March to 15th may 2002.

**Methods:** A case-control study with a total of 175 male traffic policemen who have volunteered to participate in the study was conducted. They were divided into four groups according to the state of exposure to car exhaust. Traffic policemen who were not exposed to car exhaust and not smokers were taken as controls, and exposed non-smokers were considered as study group. Questionnaire was distributed to collect relevant information from participants. Standard anthropometric instruments were used for weight and height. Microspirometer and mini peak flowmeter were used to measure FEV1, PEFR and FVC.

**Results:** Out of the 175 participants 90 were exposed to car exhaust; of these 55 were not smokers. The anthropometric parameters in the study group (exposed non-smokers) were similar to the control group. The lung function tests were not different from the control. Concerning exposure to car exhaust there was insignificant negative correlation between the duration of exposure and PEFR, FEV1and the FEV1/FVC ratio. There were no differences between the control and other group in lung functions so that chronic exposure to car exaust has no significant effect on lung functions in Sudan.

***Key words:*** lung cancer, spirometry, pulmonary function

## Introduction

Khartoum State is relatively overcrowded state with around seven million inhabitants and about 400000 moving cars during the day. Traffic policemen are on duty for 8 hours a day, 6 days a week.

Car exhaust is composed of ambient sulfur oxides, ozone precursors and aerosols, which may contribute to chronic respiratory morbidity and mortality. Mutagenic and carcinogenic compounds are adsorbed to diesel soot. Diesel was reported to cause cancer in rats through chronic inflammation, hyperplasia, multi-focal fibrosis, and macrophage particle clearance overload[1]. Diesel may be a co-carcinogen, and extrapolation of risk from laboratory animals is perilous.

In humans, occupational case control, cohort studies and recently meta-analysis of over twenty studies examining occupational exposure to diesel exhaust, confirmed a statistically significant relative risk [RR] of 1.33 for lung cancer, with adjustment for cigarette smoking[2]. Heavy exposure to diesel is clearly associated with pulmonary inflammation, with some evidence of increased incidence of respiratory symptoms (cough, phlegm, and wheezing) and reduction of pulmonary function.

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## Methods

This study was conducted between the 21st of March and the 15th of May 2002, with a case control design and the source population was the traffic policemen working in Khartoum State with the following criteria; Sudanese, males, apparently free from chronic and acute diseases and no previous respiratory occupational hazard.

A total of 175 traffic policemen have volunteered to participate in the study. The participants were divided into four groups depending on whether they were smokers or not, and whether they were exposed to car exhaust or not.

A questionnaire was designed to cover all the social, work and medical history and also used for registering the Spirometry and anthropometry results. Micro Medical Spirometer serial number 13734 produced by Micro Medical Limited / UK was used to measure the lung functions. Every session the instrument is checked for batteries, accuracy and reproducibility of readings. Mini-Peak Flow Meter, supplied by Airmed, London, was used to measure the Peak Expiratory Flow Rate (PEFR).

Two anthropometric measurements were taken on each subject (height and weight) using standard anthropometric scales with the techniques and datum points as described by the International Biological Programme. Readings were recorded to the nearest 10gm in case of weight. Standard height scale was used and readings were recorded to the nearest 0.5 centimeters. Prior to each measuring session, the scales were calibrated.

Data were entered in the computer. The statistical soft ware SPSS 9 was used for data analysis and statistical evaluation. T-test (unpaired) was used to check the difference between the means of variables in the four groups. Pearson's correlation coefficient was used to examine the correlation.

## Results

Table 1 shows 175 traffic policemen all of them were males working in Khartoum state .Ten traffic policemen were excluded from the study because their data was insufficient. Out of the 175(67.43%) traffic policemen 118 were married and 25 had high education, and the remaining are of the intermediate and secondary levels. Ninety(51.45%) policemen were exposed to car exhaust with a mean duration of 11± 1.05 years .

Table (1) Characteristic of participants

| Characteristics | Number | Percent |
|---|---|---|
| Marital status | | |
| Married | 118 | 67.43 |
| Single | 57 | 35.57 |
| Education | | |
| Illiterate | 3 | 1.71 |
| Primary | 32 | 18.29 |
| Intermediate | 58 | 33.57 |
| Secondary | 57 | 32.57 |
| Higher | 25 | 14.29 |
| Smoking | | |
| Smoker | 72 | 42.14 |
| Non-smoker | 103 | 57.86 |
| Exposure to emissions | | |
| Exposed | 90 | 51.43 |
| Un-exposed | 85 | 58.57 |

Table 2 shows the mean age was similar to the control group (non-exposed non-smokers group) .The mean weight for the exposed non-smokers was 81.65 ±1.87 kg and was significantly higher than the control group ($p<0.05$). The mean height was similar to the control .The BMI was higher in the exposed non-smokers than controls ($p<0.01$). The mean PEFR, FEV1, FVC and the FEV1/FVC ratio were similar to the control group.

## Discussion

This is the first study in the Sudan to examine the effect of chronic exposure to car exhaust on respiratory system in traffic policemen.

Age in study group was similar to control group but weight and height were significantly higher than the control group, although there are no clear reasons other than nature of recruitment for these differences in age weight and height. These differences definitely influence the results in these groups.

PEFR, FEV1 and FVC were the same in both groups; this is in concordance with findings of Battigelli et al. However the values are reduced, a result, which goes with, the decreased spirometry found by Bauer which he attributed to nitrogen dioxide present in the car exhaust[3].

FEV1 was insignificantly reduced with the duration of exposure to car exhaust and this is similar to what has been mentioned by Finlayson and this was attributed to the presence of ozone in car exhaust[4]. On the other hand, Kin and Kang found similar effects on FEV1 but they attributed the effect to the particulate component of car exhaust[5].

Table (2) Anthropometric and respiratory parameters in the control and study group of the study sample (Values are means ± standard errors of the mean):

| Characteristic | Controls (N=48) | Study group (N=55) |
|---|---|---|
| Anthropometric | | |
| Age (yrs) | 38.71±1.36 | 39.96±1.24 |
| Weight (kg) | 72.90±2.07 | 81.65±1.87 * |
| Height (cm) | 177.35±1.10 | 175.78±0.84 * |
| B M I (kg/m$^2$) | 23.18±0.64 | 26.38±0.53 ** |
| Respiratory | | |
| PEFR (L/min) | 559±12.52 | 555.55±14.53 |
| FEV1 (L) | 3.24±0.02 | 3.11±0.02 |
| FVC (L) | 3.41±0.02 | 3.36±0.02 |
| FEV1/FVC | 0.95±0.03 | 0.93±0.03 |

*P < 0.05; **P< 0.01
PEFR: Peak Expiratory Flow Rate
FEV1: Forced Expiratory Volume in The First Second
FVC: Forced Vital Capacity
BMI: Body Mass Index

## Conclusion

Chronic exposure to car emission leads to decrease in FEV1and the effect is increased with the duration of exposure

## References

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