

Air Pollution Exposures And Their Effect on Traffic Police

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Abstract- Traffic police workers, as a population exposed to urban atmosphere, were compared with a control population exposed to indoor air pollution levels. Traffic policemen have to stand for several hours a day at the road intersections with high vehicle flows. Air pollution has frequently been demonstrated to be a serious problem in the developing countries.

I. INTRODUCTION

The air pollution is the changes in the physical, chemical and biological properties in the air. The changes in the air due to number of natural and/or anthropogenic activities may cause adverse effects on human health. This is a major health hazard across the world and the largest single environmental health risk in the recent years. The health related diseases in the developing countries are increasing over the years. Air Pollution in developing world is closely related with rapid economic and social development. The main change in the air composition in the developing countries is mainly by the human created air pollution which includes increased industrialization, urbanization, rapid increase of population and transportation. The increased concentration of these activities in and near the urban areas causes severe pollution to the air and ultimately affecting to the human health. The effect ranges from minor upper respiratory irritation to chronic respiratory and heart disease, lung cancer, acute respiratory infections across the age group.

There are various pollutants in the air, namely gaseous pollutants, heavy metals, volatile organic components, toxics and suspended particulate matters, which all together are responsible for air pollution in a region. An insight into the subcategory

of the above stated pollutants shows that the increase in the ammonia, nitrogen dioxide, ozone, sulphur dioxide, nitrogen monoxide, carbon monoxide, arsenic, lead, nickel, benzene, PM2.5 and PM10 (Badami, 2005) leads to the pollution in the air. The World Health Organization (WHO) shows that each and every pollutant particles have specific emission level.

Both ingestion and inhalation are major pathways of exposure for the general population. Due to the nature and location of their work, the exposure level and ensuing health risks for traffic police are believed to be significantly higher than those of the general population.

II. LITERATURE REVIEW METHOD

1.1 Exposure of traffic police to polycyclic aromatic hydrocarbons in Beijing China

- The personal samples were collected using mini-pumps (AirLite, SKC) with teflon PUF holders (25.5 mm · 12 cm) in diameter and length) and teflon screens attached.
- Personal sampling was conducted on a traffic police squad routinely patrolling an area of approximately 62 km² in central Haidian, one of Beijing's major urban districts. A total of 6 samples were collected at 1–3 day intervals from July 31 to August 15, 2004.
- Two fixed-point sampling stations were set up on the Peking University campus; one at the east gate 20 m away from the street and the other in a student dormitory area far away from traffic.
- Sixteen PAH compounds including naphthalene (NAP), acenaphthylene (ACY), acenaphthene

(ACE), fluorine (FLO), phenanthrene (PHE), anthracene (ANT), fluoranthene (FLA), pyrene (PYR), benz(a)anthracene (BaA), chrysene (CHR), benzo(b)fluoranthene (BbF), benzo(k)-fluoranthene (BkF), benzo(a)pyrene (BaP), dibenz(ah)-anthracene (DahA), indeno(1,2,3-cd)pyrene (IcdP) and benzo(g,h,i)perylene (BghiP) were analyzed on a HP 6890 gas chromatograph connected to a HP 5973 mass selective detector and a HP-7673 A automatic sampler.

- Meteorological parameters including temperature, humidity, wind direction, wind speed, precipitation and solar radiation were also collected during the study period.

1.2 Traffic-related air pollution. A pilot exposure assessment in Beirut, Lebanon

- The volunteers group includes 24 traffic policemen and 23 office policemen which constitute the control group. The traffic policemen group consisted of officers.
- Urine samples were collected at both pre-shift and post-shift and stored at 80 °C until analysis.
- After the sample analyzed in laboratory.

1.3 Health risk assessment for traffic policemen exposed to polycyclic aromatic hydrocarbons (PAHs) in Tianjin, China

- All samples were collected in Tianjin, China during the summer of 2005 (from July to August) at places of road side, road interaction, University campus pm₁₀ samples were collected on quartz filters by Model 200 personal environmental monitors during traffic policemen's work time.
- Risk assess was defined from the Incremental lifetime cancer risk (ILCR) model

$$ILCR = \frac{CSF \cdot C \cdot IR \cdot t \cdot EF \cdot ED}{BW \cdot AT}$$

ILCR=Incremental lifetime cancer risk of the occupational exposure (dimensionless)

CSF=Inhalation cancer slope factor of BaP (kg/mg)

C=BaPeq concentration (mg m⁻³)

IR=Inhalation rate (m³ h⁻¹)

t=Daily exposure time span (6 h/ d, for two shifts)

EF=Exposure frequency (250 d year⁻¹ a, upperbound value)

ED=Exposure duration (25 years, upper-bound value)

BW=Body weight (lognormal (59.25, 1.05)_b, average value)

AT=Averaging time (equal to 70 years for carcinogens)

1.4 Inhalation exposure of traffic police officers to polycyclic aromatic hydrocarbons (PAHs) during the winter in Beijing, China

- Samples collected samples on 10 separate days during a period from January 10 to 26, 2005. For each sampling day, three personal samplers, each of which carried by a group consisting of four on-duty police on each shift carried simultaneously for 12 h from 7:00 am to 7:00 pm.
- Low volume polyurethane foam (PUF plugs from Supelco, 22 mm OD×7.6 cm length) and quartz fiber filters (QFFs, 22 mm in diameter) were used for gaseous and particulate phase PAHs collection.
- The carcinogenic potential of PAH exposure through inhalation was evaluated by calculating BaP equivalent concentration (BaPeq). The calculated BaPeq values were evaluated against the national standard of 10 ng/m³ for ambient air.

1.5 Urban air quality and carboxyhemoglobin levels in a group of traffic policemen

- 228 was the final number of subjects recruited for the study. Sampling period lasted 13 months, from March 2002 to April 2003. Each working Thursday, at the end of the working shift (always from 7 a.m. to 2 p.m.), 5 policemen responded to a questionnaire, their weight and height were recorded, a urine spot collected to measure cotinine as biomarker of tobacco smoke exposure and 2 ml of arterial blood sample was drawn to measure carboxyhemoglobin.
- Data relative to CO air pollution, sampled by the local Environmental Protection Agency (A.R.P.A.), were collected hourly from January 2002 to December 2004 contemporaneously in all the 6 sampling sites of the city.

2.6 Sister chromatid exchange induction in peripheral blood lymphocytes of traffic police workers

- The study includes 54 traffic policeworkers occupationally exposed to typical urban air pollutants and 35 referent subjects recruited from male workers employed at the National Cancer Institute.
- Individual exposure to benzo[*a*]pyrene (B[*a*]P), benzo[*b*]fluoranthene and benzo[*k*]fluoranthene (B[*b*]F, B[*k*]F) was assessed by using personal samplers worn by each individual on Thursday during the work shift. Blood samples were collected on Friday morning.
- Univariate statistical analysis was performed using the Mann–Whitney non-parametric test statistics for comparing PAH air levels detected in police officers and referents, and the *t*-test and the Duncan's multiple range test statistics for comparing log-transformed SCE frequencies detected in different strata of dichotomous and polycotomous covariates.

2.7 Effects of Air Pollution on Public Health: The case of Vital Traffic Junction under Kolkata Municipal Corporation

- Primary data were collected during the daytime of the city which includes the busiest road crossing, commercial and residential areas from different parts of the city.
- The targeted group for each survey includes traffic police, garage mechanics, public transport-drivers, salesmen, hawkers and shopkeepers.

2.8 Assessment of Occupational and ambient air quality of traffic police personnel of the Kathmandu valley, Nepal; in view of atmospheric particulate matter concentrations (PM₁₀)

- The air quality monitoring was carried out for one year covering pre-monsoon, monsoon, post-monsoon and winter season during the period of February 2008 to January 2009 in ten major high density traffic areas of Kathmandu valley.
- To monitor ambient air quality and SKC Personal Air Sampler were used to quantify the concentration of subjective exposure to PM₁₀ in occupational environment in major High Density Traffic Areas of Kathmandu Valley.

- The concentration of PM₁₀ was calculated using the gravimetric method.

III. CONCLUSION

The traffic policemen in this study were strongly higher than that measured in traffic policemen. Difference in many of environment factors, such as traffic characteristics, quality of fuel, meteorological conditions, building characteristics of the area, and difference in physical activity in the workplace may contribute to the difference in the levels of individual VOCs exposure.

The compound effect of vehicular pollution might be due to the enormous number of old and unmaintained use of adulterated petrol and diesel, traffic congestion and inadequate emission control. Considering these issues, necessary steps need to be taken to improve the quality of the environment as well as the health of the traffic policemen.

This can be treated as a danger sign for the public health of the concerned areas, particularly for those who are exposed to such high air pollution level due to their occupational compulsion. An ever-increasing vehicle density of the city, there was a need to evaluate the genetic risk on traffic policemen exposed to automobile exhausts.

REFERENCES

- 1) Exposure of traffic police to Polycyclic aromatic hydrocarbons in Beijing, China Y.N. Liu, S. Tao , H. Dou, T.W. Zhang, X.L. Zhang, R. Dawson
- 2) Traffic-related air pollution. A pilot exposure assessment in Beirut, Lebanon Mireille Borgie, Anne Garat, Fabrice Cazier, Agnes Delbende, Delphine Allorge, Frederic Ledoux, Dominique Courcot, Pirouz Shirali, Zeina Dagher
- 3) Health risk assessment for traffic policemen exposed to polycyclic aromatic hydrocarbons (PAHs) in Tianjin, China Yandi Hu, Zhipeng Bai, Liwen Zhang, Xue Wang, Li Zhang, Qingchan Yu, Tan Zhu
- 4) Inhalation exposure of traffic police officers to polycyclic aromatic hydrocarbons (PAHs) during the winter in Beijing, China Yanan Liu, Shu Tao, Yifeng Yang, Han Dou, Yu Yang, Raymond M. Coveney
- 5) Urban air quality and carboxyhemoglobin levels in a group of traffic policemen R. Bono, P.

- Piccioni, D. Traversi, R. Degan, M. Grosa, G. Bosello, G. Gilli, W. Arossa, M. Bugiani
- 6) Sister chromatid exchange induction in peripheral blood lymphocytes of traffic police workers Claudia Bolognesi, Elena Gallerani, Stefania Bonatti, Marcella De Ferrari, Vincenzo Fontana, Federico Valerio, Franco Merlo, Angelo Abbondandolo
 - 7) Effects of Air Pollution on Public Health: The case of Vital Traffic Junctions under Kolkata Municipal Corporation Anwesha Chakraborty
 - 8) Assessment of occupational and ambient air quality of traffic police personnel of the Kathmandu valley, Nepal; in view of atmospheric particulate matter concentrations (PM10) Ahmad Kamruzzaman Majumder, K.M. Nazmul Islam, Roshan Man Bajracharya, William S. Carter