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Original article:

Blood lead levels in traffic police personnel in different traffic zones of Dehradun City of Uttarakhand

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ABSTRACT:

Background: Traffic police personnel have the unenviable task of standing at busy junctions and regulating vehicular movement. The occupational hazard they face is constant exposure to polluted air. They are identified to be at a higher risk of exposure to air pollution and its contaminants such as lead.

Materials and Methods: A total of 63 subjects (43 traffic police personnel & 20 controls) participated in this study. The traffic police personnel were from seven different traffic zones of Dehradun. The subjects were 22 to 60 years of age and controlling traffic from 3 months to 12 years, 8 hours a day, 6 days a week. Controls were taken from the healthy individuals, who were residing in comparatively very low traffic areas. An informed consent was obtained from all the participants. They were asked to fill a questionnaire which included the details regarding their education, dietary habits, dinking water supply, type of housing, residing locality, medical history including use of over-the-counter or any other medication especially Ayurvedic/herbal medications. The participants were divided into two groups.

Results: Comparison of two groups using Student's t test showed significantly elevated blood lead level in Group I as compared to the Group II (traffic police vs healthy controls) ($p<0.05$). Further, we compared the blood lead levels of traffic police personnel posted in different traffic zones of Dehradun. One traffic policeman posted in Interstate Bus Terminus (ISBT) area showed high blood lead level (>10 µg/dl) while all the traffic police personnel from Vasant Vihar area had blood lead level <3.3 µg/dl.

Conclusion: Blood Lead levels are gradually falling in the general population but still more studies are required to elucidate the prevalence of lead toxicity in general population as well as in traffic police personnel.

Keywords: Lead, toxicity, traffic police, exposure

Introduction

Lead has been mined and used by mankind for 6,000 years, and the history of lead poisoning is nearly 2,500 years old. In 200 BC the Greek physician Dioscorides observed that "lead makes the mind give way." In the beginning of the 19th century, lead poisoning was found largely as an occupational disease of adults. Lead poisoning is now well documented and persists as a major public health problem throughout the world [1]. Globally it is an abundantly distributed, important yet dangerous environmental chemical [2]. Lead poisoning is also called 'plumbism'. This is because of the ill effect of lead and lead-containing materials on various organs. It affects multiple systems and has role in the production of reactive oxygen species (ROS).Lead is a recognized environment pollutant. Lead in petrol has caused more environmental lead exposure than any other source. The World Health Organisation (WHO) estimates that 1.2 crore people are over exposed to lead and 99% of the most serious cases are in the developing world. Several studies identified various biomarkers of lead (Pb) toxicity. Study undertaken by George foundation in six major cities of India reported that 40.2 %of adults and 51.4 % of children had BLL>10 µg/dl [3].Lead gets absorbed through lungs, intestine and skin. Blood lead level rise rapidly after a recent exposure [4].The absorption, storage and excretion of lead, modify the blood lead concentration in the body and therefore its effects. It gets accumulated in red blood cells (RBCs) and other organs. Lead enters the foetus from the mothers' blood. Once it gets accumulated in the brain, it cannot be removed. Lead is also stored in bones for a long period. In petrol, it is used as tetraethyl lead. It is commonly found in ceiling dust at home [5]. A recent World Health Organization (WHO) global burden of disease estimate found that lead-induced mild mental retardation amounts to 9.8 million disability-adjusted life years (DALYs), while in comparison, the burden of cardiovascular disease results in 3.1 million DALYs each year[6]. Much research over the last 30 years has demonstrated adverse health effects of moderately elevated blood lead levels, i.e. below 25 mg/dl. The permissible exposure level in the ambient (air, water, soil, etc.) environment, as well as in the working environment, has therefore been progressively lowered [7-11].The blood lead levels in adults have been reported in Jodhpur city of India [12].

Traffic policemen have been previously identified as at a higher risk of environmental air pollution including lead toxicity due to exposure to atmospheric lead contaminants [13] to which combustion of leaded petroleum was a significant contributor prior to it being unleaded [14]. In 2002, Amarasinghe compared blood lead levels among traffic police and non-traffic policemen and women. Though his analysis revealed both groups to have elevated blood lead levels, there was no statistically significant difference between the two groups 15]. The present study, the first of its kind in Uttarakhand was carried out to determine the effect of environment exposure on levels of lead in traffic police personnel as they constitute a high risk group to lead exposure.

Aim and Objectives:

The aim of our study was to assess the levels of lead in traffic police personnel, as they constitute a high-risk group to lead exposure

Materials and Methods:

A total of 63 subjects (43 traffic police personnel & 20 controls) participated in this study. The traffic police personnel were from seven different traffic zones of Dehradun. The subjects were 22 to 60 years of age and controlling traffic from 3 months to 12 years, 8 hours a day, 6 days a week. Controls were taken from the healthy individuals, who were residing in comparatively very low traffic areas. An informed consent was obtained from all the participants. They were asked to fill a questionnaire which included the details regarding their education, dietary habits, dinking water supply, type of housing, residing locality, medical history including use of over-the-counter or any other medication especially Ayurvedic/herbal medications. Prior to start of the study, permission was obtained from Ethical Review Committee of the Institute. An informed consent was obtained from all the participants. Guidelines of Helsinki (2013) were followed for human analysis [16].

Blood samples were collected from all participants by aseptic technique. 5 ml blood was collected and was quickly transferred to test tubes already containing EDTA anticoagulant. Blood lead level was estimated by using lead care II blood lead analyzer (Magellan Diagnostics USA, The Lead Care II System).

Statistical analysis

Descriptive statistical analyses were performed using SPSS software (version 20, 2008). Data were summarized as Mean ± SD of Groups (cases vs controls) compared by unpaired or independent t test.

Observation and Results

The participants were divided into two groups, Group I comprising of 43 traffic police personnel working in field and Group II of 20 age & gender matched healthy controls. Table 1 summarizes the mean level of blood lead in the two groups. Comparison of two groups using t test showed significantly elevated blood lead level in Group I as compared to the group II ($p<0.05$). Further, we compared the blood lead levels of traffic police personnel posted in different traffic zones of Dehradun. The results are summarized in table 2. As shown in the table, 1 traffic policemen showed blood lead level >10 µg/dl and he was posted in Interstate Bus Terminus (ISBT) area. Commercial area ISBT registered poor air quality levels in a recent data released by Uttarakhand Pollution Control Board (UPCB) for the period between January and September, 2017, with an average particulate matter 10 (PM 10) levels at 282.493 µg/m3. The traffic police personnel from Vasant Vihar area had blood lead level <3.3 µg/dl. This area is a relatively clean, green and low traffic congestion area of Dehradun.

Table 1: Comparison of blood lead levels (mean ± SD) in Group I vs Group II

Parameters	**Group I (n=43)**		**Group II (n=20)**		**p value**
	Mean	Standard Deviation	Mean	Standard Deviation	
Blood Lead level (µg/dl)	3.47	1.45	2.15	1.16	0.0007

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Table 2: Lead content in the blood samples of Traffic Police personnel posted in different areas of Dehradun

S. No.	Groups	Blood lead level <3.3 µg/dl		Blood lead level 3.3-10 µg/dl		Blood lead level >10 µg/dl	
		n	%age	n	%age	n	%age
1	Kargi Chowk (n=10)	7	70	3	30	0	0
2	Race Course (n=3)	2	66.7	1	33.3	0	0
3	ISBT (n=4)	3	75	0	0	1	25
4	Clock Tower (n=6)	5	83.3	1	16.7	0	0
5	Vasant Vihar (n=6)	6	100	0	0	0	0
6	Prem Nagar (n=7)	5	71.4	2	28.6	0	0
7	Garhi Cant (n=7)	5	71.4	2	28.6	0	0

Discussion

There is increased evidence that health may be harmed by chronic exposure to lead present in the environment at the levels insufficient to produce classical symptoms of lead poisoning [17, 18]. Air pollutants generated from traffic and industrial plants are believed to be one of the major causes of DNA damage in living species. As a result of rapid urbanization, air pollution and environmental quality deterioration our daily lives and ecosystem have been affected. Under these circumstances, humans, plants and animals might suffer from various damages. Traffic policemen are heavily exposed to vehicle exhausts during traffic control and other outdoor activities [19]. In our study we found an increase in the blood lead levels in traffic police as compared to the controls (3.47± 1.45 µg/dl vs 2.15± 1.16 µg/dl) although the levels were within in the normal range. We also found that traffic policemen working in ISBT area of Dehradun had higher lead levels while those posted in Vasant Vihar had lower content of lead in their blood. These differences may be due to exposure to air, which contains dust particles rich in lead and non polluted area viceversa. To our knowledge, no previous study has reported blood lead levels in Dehradun area.

The levels found in our study were less than the previously reported studies from Pakistan which documented higher Pb levels in traffic wardens [20, 21]. Another study in Alexandria, Egypt reported that their traffic constables had a higher blood lead level [22]. The higher levels of lead in Egypt and Karachi might be due to increased industrialization and urbanization. Traffic police personal have the unavoidable task of standing at busy junctions and regulating vehicular movement. In a comparable study from Nigeria, the lead level was high in wardens than controls [23]. A previous study in Madras, India, showed a non-vegetarian diet and job category remained the strongest predictors of blood lead level ($p < 0.05$), while smoking, alcohol consumption, and duration of employment were not significantly correlated with blood lead levels. They conclude that continued use of leaded gasoline probably plays a dominant role in determining blood lead levels in Madras [24]. The occupational hazard they face is constant exposure to polluted air. It results in elevated lead content in blood that affects all organs and functions of the body to varying degrees.

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Conclusion: Blood Lead levels are gradually falling in the general population still further measures need to be adopted to limit use of lead in our day to day life. In high risk group such as traffic police lead toxicity and exposure may be still prevailing. Hence, more studies are required to elucidate the prevalence of lead toxicity in general population as well as in traffic police.

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Compliance with Ethical standards

Conflict of Interest: None.

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