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Health Risk Assessment of Traffic Wardens of Lahore, Pakistan, through Trace Metal Evaluation

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ABSTRACT

Human health is thought to be affected by many factors. Air consists of a large number of chemical compounds which are considered pollutants when they found in unnaturally high concentrations and have the potential to harm the environment and human health. Air pollution is at the top rank among environmental contaminants. Heavy metal toxicity is now gaining its place as one of the major factors contributing to detrimental outcomes for human health. Air quality in the urban area is generally poor, especially at traffic intersection roadsides due to continuous vehicular emissions comprising heavy metals, benzene, diesel soot, polyaromatic hydrocarbon, etc. the study encompassed the target area of Lahore, Pakistan where vehicle traffic is believed to be higher and close to industrial zones. Traffic wardens (n=5 from each area) reared in the twelve different zones/sectors of Lahore were added in the study and the effect of heavy metals toxicity was evaluated *via* biochemical examination of blood and hair samples. The wet-acid digested samples were analyzed by Flame Atomic Absorption Spectrophotometer (FAAS). An interviewer-administered questionnaire was used to collect history of the subjects. The results of the study indicated a significant difference in trace element concentration in almost all the blood and hair samples as compared to the World Health Organization (WHO). This study can be used as a foundation and reference for future studies. This investigation revealed that biological samples serve as a good tool to bio-monitor the environmental pollution in urban area.

Keywords: Heavy metals; Toxicity; Residual effects; Human health

INTRODUCTION

Traffic police have been previously identified as at a higher risk of environmental air pollution including metals toxicity due to exposure to atmospheric contaminant [1]. Heavy metal pollution is at a top rank among environmental contaminants. Heavy metals are abundantly found elements on the earth crust which have relatively higher density ranging between 4 to 5 g/cm^3 [2]. Comparison to other metallic substances, heavy metals have high atomic weight, but Trace amount of heavy metals like Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), are essential for living organisms while higher concentrations can cause harmful effects. Accumulation of heavy metals like cadmium, lead and mercury can seriously affect human and other animal bodies with passage of time, [3].

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Being a dense metalloid heavy metals are well known for its latent toxicity, especially in human body where they can caused a range of disease and ecological damage [4].

Human activity has increased the amount of heavy metals deposited on the surface of earth many times and in many ways. Combustion process is the most important source of heavy metals deposition, particularly power generation, smelting, incineration and the internal combustion engines [5]. Vehicular emission rate of Zinc (Zn), Copper (Cu), Lead (Pb), Nickel (Ni) was found in range of 1-35 µg/vehicle/km [6]. Zinc (Zn), Copper (Cu), Lead (Pb), contributes about 90% of heavy metals emitted by vehicular emission whereas Cadmium (Cd) and Nickel (Ni) also contributed in small proportion [7]. Street dust is mainly composed of gas originated particles from automobiles exhausted or wind transported particles that may contain a significant amount of metals like Lead (Pb), Copper (Cu), Manganese (Mn), Cobalt (Co), Nickel (Ni) and Zinc (Zn) [8]. The main threat to human health from heavy metals are associated with exposure to like Lead (Pb), Copper (Cu), Mercury (Hg) and Arsenic (As). These metals have been extensively studied and their effect on human health regularly reviewed by international bodies such as WHO [9]. The WHO reports showed that lead poisoning has caused 143,000 deaths and added to 600,000 cases of lost to disability in younger. Heavy metal impact on human and animal health warrants further investigation of its residue in food, air and water and in biological samples like different tissues, organs of human and animal bodies

There are number of sources of heavy metals in different cities of Pakistan. However, Lahore with heavy traffic on roads and surrounded by number of different industries have severe problems with air quality. Thus vehicular and industrial emissions are being deposited in the air where traffic wardens take breath. Levels and types of heavy metals in such polluted area should be determined. Traffic controlling wardens, are frequently exposed occupational grouped to the vehicular emissions in busy traffic areas which are reported to be dangerous for lungs [10]. In developing countries like Pakistan, this group faces many health issues due to very high exposure and lack of using Personal Protective Equipment (PPEs) by the traffic police. This study will guide the government's authorities to reinforce the policy for effluent treatment by the industries and vehicle emission before added to environment. Data generated through this study will help both national and international organization by executions environmental safety control system in acceptance with international standards to ensure complete safe and high clean environments. It has crucial importance with respect to public health issues and environments [11-13].

MATERIALS AND METHODS

Methodology

Two research centers were selected to perform this research. The Atomic Absorption Laboratory (AAS) of department of chemistry, Government College University Lahore (GCU Lahore) and Emergency Laboratory Mayo Hospital Lahore were used for the Heavy metal residue analysis and biochemical analysis (hematological profile), respectively in blood and hair samples of traffic police wardens of twelve zones. It was ensured that there is no breach of scientific ethics in obtaining these specimens. All samples were collected in accordance with ethical guidelines issued from ethical committee of GC University (letter no. GCU-IIB-243) and proper consent of the individuals.

Traffic wardens working within urban city limits in zones identified having high traffic density (based on data obtained from the IG office of chief traffic officer Lahore) were consider eligible for the study. A minimum period of active service in the field for at least 4-6 months or greater was used as inclusion criterion for individual who were directly diagnosed with metal toxicity while those who were recently transferred in area outside of the defined area and those who refused consent were excluded. More than 180 persons were found eligible and included in cross sectional analysis. Samples of peripheral blood (5 ml) were taken by venipuncture with help of syringe under aseptic condition by trained phlebotomists in the month of November 2019 to January 2020 after informed consent. The container used to collect the blood samples were residue free heparinized vials contain 0.2 ml of EDTA to avoid clotting. Hair samples were also collected for analysis of heavy metals from the same person who donated their blood voluntary to this research study. An interviewer administered questioner was utilized to obtained data from the participant with regards to their socio–demographic information, use of personal protective equipment, exposure to other source of toxic metals including environmental exposure other than atmospheric, use of Ayurveda (indigenous) medication and the presence of any symptoms related to that of metals toxicity. The above factor was defined as binary or categorical variables as appropriate. A targeted clinical examination was conducted for sign of chronic metals toxicity by the investigators, *i.e*., were blue line on gums and feature of peripheral neuropathy (*i.e*. wrist drop and foot drops). Atomic absorption along with the acid digestion method was used to measure residual effect of zinc, lead, copper, chromium, nickel, iron, manganese, cadmium, and silver.

Analysis of heavy metals residues in biological samples of traffic warden's: Using atomic absorpt on methods: Samples of blood and hair were collected from traffic wardens to evaluate the concentration of heavy metals residues of chromium, copper, zinc, lead, iron, magnesium, manganese, and Nickel in collected biological samples. The detail of collected samples is enlisted in **Table 1**. Separate marking pattern were followed to label the collected samples (n=5 from each study sector) sampling dates along with the numbering pattern were also included in labeling to get the accurate results, samples were transferred on regular basis to atomic absorption laboratory GCU Lahore. Wet digestion was used for processing of collected samples and the residual effects of heavy metals on blood and hair were measured by atomic absorption.

Table 1: Number of sample collected from twelve different area of Lahore city, Pakistan.

Sector name	No of samples collected	
	Blood	Hair
Shahdara	5	5
Larri Adda	5	5
Ravi Road	5	5
Railway Station	5	5
Kotwali Gate	5	5
Misri Shah	5	5
Gahrishao	5	5
Mughalpura	5	5
Mackload Road	5	5
Thoker Niaz Bag	5	5
Sheera Kot	5	5
Multan Road	5	5

Wet Digestion of Samples

Blood sample preparation: 3 ml of blood samples was taken in 100 mL digestion lask then added with freshly prepared mixture of concentrated nitric acid and hydrogen per-oxide (2:1 v/v). Mixture was heated and three mL of hydrogen peroxide was added in samples a ter cooling, then the mixture was heated to the point when the white fumes appeared. Total volume of samples was reduced to 2-4 ml. Mixture was then diluted up to 10 ml with double distilled water, ilter with Whatman no. 42 and stored immediately at 4°C for further analysis on AAS

Hair sample preparation: 1 mg of the chopped hair sample was placed in a labeled conical lask. Then added 3 ml freshly prepared mixture of HNO_3 and H_2O_2 in a particular ratio of 6:2 (v/v), respectively. The lask was placed on hot plate for heating of sample in a fume hood and remained there for a few minutes to precede the acid digestion process, with white fumes appeared, the total volume of samples reduced to 2-4 mL. Mixture was then diluted up to 10 mL with distilled water, ilter with Whatman no. 42 and stored immediately at 4°C for further analysis on AAS.

All the samples were prepared by using the above mentioned procedure. The whole process was completed in three laboratories *i.e.* organo-pharmaceutical, and inorganic research laboratory in the department of chemistry, government college university, and Lahore.

Atomic Absorption Spectroscopy

The heavy metals in the blood and hair samples were examined by Flame Atomic Absorption Spectrophotometry (AAS), AA-7000F Shimadzu, Japan. Standard operating procedure and so tware WizAArd used to perform this analysis.

A calibration curve was plotted using working standards of 0.5, 1.0, 2.0 and 4.0 ppm, prepared from 1000 ppm Merck standards. The process was standardized by running the standard solution after each twenty samples of known concentration.

Hematological Tests

Freshly collected blood samples traffic wardens were analyzed for the hematological assay using an automatic analyzer. White Blood Cells (WBC), Red Blood Cells (RBC), Hemoglobin (HGB), Mean Corpuscular Volume (MCV), platelet count, lymphocytes, total bilirubin, Alanine Aminotransferase/Serum Glutamic Pyruvate Transaminase (ALT/SGPT), Alkaline Phosphatase (ALKP), Creating Phosphokinase (CPK), Lactate Dehydrogenase (LDH), Blood Urea Nitrogen (BUN), creatinine, blood urea and hematology was run on all samples, reading was noted after finishing the examination of blood samples for their hematological and clinical chemistry medical chart was retrieved from obtained results presented in Tables 4-6 respectively as mean ± SEM

Statistical Analysis

Analysis for heavy metal was done by using SPSS software and descriptive analysis was performed. For hematological analysis we applying univariate analysis of variance and multi comparison was done by Duncan's and Tukeys test.

RESULTS AND DISCUSSION

A total of ten heavy metals were analyzed in human blood and hair taken from traffic wardens simultaneously across twelve different zones in Lahore city, Pakistan comprised of

Shahdara, Lori Ada, Ravi Road, Railway Station, Kotwali, Misrishah, Mughul Pura, Macload Gharishaho, Tokar Niaz Baig, Sherakot, Multan road respectively where 5 trafic wardens of police department in Lahore were approached to collect the sample in each area total 120 sample were collected where 60 sample comprising of blood and 60 sample consisting of hair and it showed a 100% of the total sample and 33.1% for each area. The selection of different Zones was based on the fact that, these areas are densely and highly. This data is elaborated in form of frequency **Tables 2 and 3**. The concentration of heavy metals in the biological samples tested in the study is being reported here as **Figures 1 and 2** illustrates overall concentration of heavy metals in human blood and similarly **Figures 3 and 4** in hair samples respectively, however, the concentration of heavy metals tested in this study came out to be below the detection limit except for Zn and Fe. The mean concentrations of Zinc (Zn) in blood samples came out as 1.61 ± 0.19 ppm across all the study sites. The highest concentration of Zinc (Zn) was observed in blood samples of subjects on duty at Multan Road site (7.42 ppm), followed by Shahdara (1.28), Lori adda (1.22), Gharishahoo (1.19 ppm), Macleod (1.16 ppm), Ravi Road (1.1 ppm), Sherakot (1.07 ppm), Thokar Niaz Bag (1.04 ppm), Railway station (1.04 ppm), Kotwali (1.02 ppm), Msrishah (0.91 ppm) and Mughalpura (0.9 ppm). Similarly, the mean concentrations of Iron (Fe) was observed as 19.7±2.04 ppm, with Fe being highest in quantity at Lori Ada site (28 ppm), followed by Shahdara (26.23 ppm), Kotwali (24.88 ppm), Railway station (22.43 ppm), Ravi road (22.24 ppm), Msrishah (21.01 ppm), Gharishahoo (18.01 ppm), MacLeod (17.36 ppm), Thokar (16.64 ppm), Sherakot (15.11 ppm) and Multan road (10.7 ppm). Similarly, **Figure 2** illustrates the concentration of heavy metals in hair samples of traffic wardens was determined using Atomic Absorption Spectrophotometer (AAS). The mean concentrations of Zinc (Zn) in Hair samples came out as 3.51 ± 0.88 ppm across all the study sites. The highest concentration of Zinc (Zn) was observed in Hair samples of subjects on duty at Railway station (4.97 ppm) followed by Sherakot (4.67 ppm), Thokar Niaz Bag (4.21 ppm), Macleod (3.66 ppm), Shahdara (3.56 ppm), Multan Road (3.51 ppm), Kotwali (3.35 ppm), Ravi Road (3.21 ppm), Mughalpura (3.02 ppm), Lori adda (2.97 ppm), Misrishah (2.56 ppm) and Gharishahoo (2.45 ppm). Similarly, the mean concentrations of iron (Fe) was observed as 13.84 ± 3.26 ppm, with Fe being highest in quantity at Kotwali site (28.13 ppm), followed by Shahdara (22.27 ppm), Multan road (20.48 ppm), Misrishah (20.6 ppm), Railway station (14.32 ppm), Lori adda (14.5 ppm), Sherakot (12.37 ppm), Gharishahoo (8.97 ppm), Ravi road (8.93 ppm), Mughalpura (7.94 ppm), Thokar Niaz Bag (6.52 ppm), and Macleod road samples which is (1.62 ppm). The concentration of zinc and iron came out as the highest among all the elements due to the fact that, these metals are found in the highest quantities in the environment to which the subjects were exposed. The same has been discovered by Shahid I, et al. in their study on source apportionment and characterization of Particulate Matter (PM10) in urban environment of Lahore. The reason is that Zn possibly comes from the tire wear or fuel burning and contributes as the fingerprint of vehicular emission sources in recent PMF analysis. Furthermore, vehicular emission is identified by high loading of Organic Carbon (OC) and Elemental Carbon (EC), Arsenic (As), Lead (Pb), Cadmium (Cd), Sulphur (S), Iron (Fe), and contributed 26.5% to the PM10 mass. So vehicle exhaust is an important particulate contributor to ambient air in urban areas [14]. Different numbers of factors were examined to be responsible for sources of elemental concentration in the environment as Industrial dust, vehicular emission, biomass burning, coal combustion and re-suspended dust that contributed 18.2%, 26.5%, 24.3%, 26.3% and 4.6% respectively to PM10 mass. The first source is identified as industrial dust, which has a major contribution from Copper (Cu), Chromium (Cr), Cadmium (Cd), Iron (Fe), Manganese (Mn) and Nickel (Ni) which results in 18.2% average mass of PM10. These heavy metals contribute greatly to industrial emissions in the urban and sub-urban areas [15]. Furthermore, the rubber, steel and leather industries are assumed to be a substantial particulate contributor to the present site. One of the reasons for this high concentration was the existence of some metal manufacturing plants and heavy industries, located near the sampling site. Iron and steel industry exhaust contributes a significant amount of PM10 to ambient air [16]. The PM10 concentration related to Iron (Fe), and Cadmium (Cd), was 39.5% and 59.5% respectively. Possible reasons could be tire abrasion, incineration, and combustion of fuels and lubricants According to study on source apportionment. Enrichment of crust elements/soil trace elements *i.e*. Aluminum (Al), Calcium (Ca), Iron (Fe), Magnesium (Mg), and Thulium (Ti) can be attributed to being major constituents of air born soil and fugitive dust. These metals mainly have an important contribution in the coarse particle fraction [17].

Table 2: Frequency tables for sample nature showed the frequency distribution of 60 respondents from traffic wardens of police department in Lahore.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Blood	60	49.6	50	50
	Hair	60	49.6	50	100
	Total	120	99.2	100	
Missing	System	1	0.8		

Total	121	100	

Table 3: Frequency tables for area showing the distribution of total sample into 12 different area.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Area 1	40	33.1	33.3	33.3
	Area 2	40	33.1	33.3	66.7
	Area 3	40	33.1	33.3	100
	Total	120	99.2	100	
Missing	System	1	0.8		
Total		121	100		

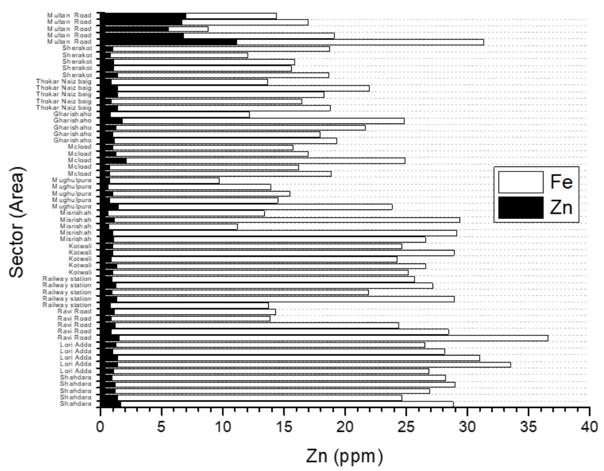

Figure 1: Distribution of Zn and Fe in blood samples of twelve different zones in Lahore city, Pakistan.

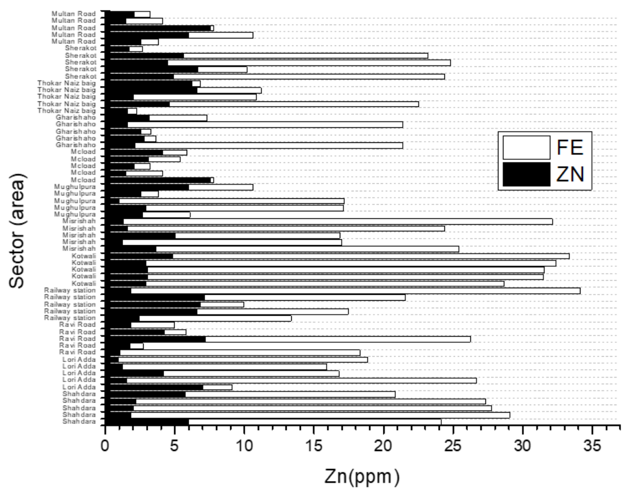

Figure 3: Distribution of Zn and Fe in b hair samples of twelve different zones in Lahore city, Pakistan.

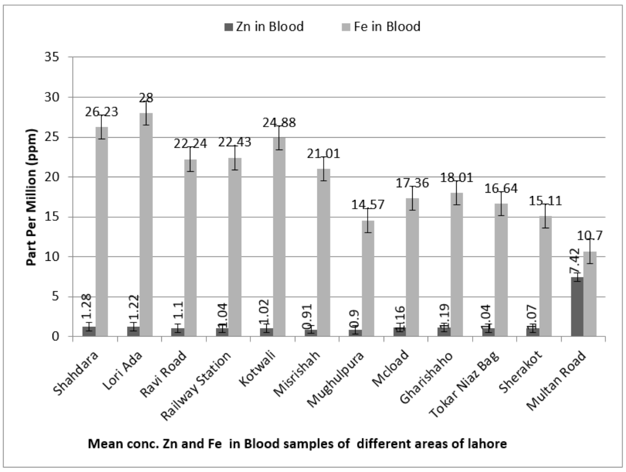

Figure 2: The mean concentration of Zn and Fe in blood with standard error mean.

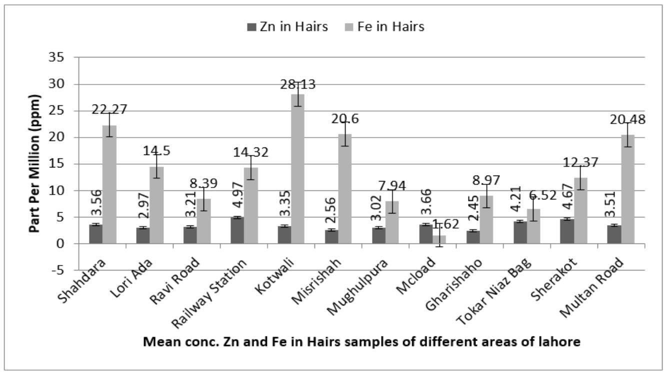

Figure 4: The mean concentration of Zn and Fe in hair with standard error mean.

It should be noticed that, other than Zinc (Zn) and Iron (Fe), both blood and hair samples were also tested for Lead (Pb), Cadmium (Cd), Chromium (Cr), Nickel (Ni), Manganese (Mn), Copper (Cu), Gold (Au), and Silver (Ag).

But, none of these metals have been detected in our samples because of low detection capacity of flame atomic absorption spectrophotometer. The average particulate matter has been reported to be higher than WHO guidelines in Asian countries. The study shows elevated concentration near road side ambient environment's and the corresponding exposure for people working near busy traffic zones. Air pollutant introduces harmful effect on the environment, human health and has potentially lethal type of environmental pollution. The continuous and rapid increase in industrialization, urbanization, and motorization resulted this menace.

Zinc (Zn) is essential for living organisms and its play important role in growth development, differentiation and gene transcription [18]. Zinc function as being catalytic, structural and regulator in nature [19]. It is part of the almost 300 enzymes also playing a significant role in cell replication, nucleic acid metabolisms, cell division and cell activation. It is concerned with quenching of free radicals, activity of super oxide dismutase (antioxidant enzymes) and required for the T lymphocytes proper functioning in human body. It play role as antioxidant and stabilize cell membrane. It has vital role in immune system development and maintenance. It also play role in blood glucose level and increase the action of insulin. Its manages insulin and blood glucose level as well as it is involved in urea formation. Zinc (Zn) is also essential for neural growth, neural transmission, neurogenesis and synaptogenesis [20].

Excessive exposure to the Zn is lethal and its can impede with metabolism of other minerals particularly iron and copper in human body. Increased absorption during embryogenesis can be dangerous their elevated exposures lead to negative effects as oxidative stress to various molecules like protein, lipids and DNA.

While Iron in the 17th century, is considered as vital trace element for human body. Its constitute protein as hemoglobin and Myoglobin. Hemoglobin represents two-third of the body's iron. Iron (Fe) is required for normal oxygen transportation, cellular metabolism, and vascular function. Insufficient of amount of iron manifest much health issue in human body particularly, decreased immunity and lowered. Hemoglobin synthesis leading to sever complication as insomnia and anemia. Iron is an essential part of various enzymes and correlated to glucose metabolisms and insulin activity. Its act as crucial cofactor necessary for cell function and maintenance as oxygen monitoring, RNA synthesis respiration, gene regulation, tricarboxylic acid cycle, lipid metabolism, DNA synthesis, and catalysis.

Excessive amount of Iron (Fe) adds free radical in living systems that damages double stranded DNA and oncogene activation. In addition, Iron (Fe) can also contribute malignant cell growth that is responsible for rapid and uncontrolled cell division ultimately resulting cancer.

It has been documented that excessive Iron (Fe) is a growing threat for liver and stomach cancer, increase intake of Iron (Fe) is responsible for estrogen–induced kidney tumors in Syria hamsters and mammary cancer in rats. Elevated levels of Iron (Fe) absorbed via inhalation, account for the cancer of larynx, bronchi, lungs mediastinum and breast. Oxidative forms induced changes in heredity material that is known as first step concerned with iron stimulating mutagenesis and carcinogenesis.

In comparison to the permissible limits of Zinc (Zn), Lead (Pb), Cadmium (Cd) Chromium (Cr), Iron (Fe), Nickel (Ni) Manganese (Mn) Copper (Cu), Gold (Au), and Silver (Ag).) according to the World Health Organization (WHO) and Recommended Dietary Allowance (RDA), respectively. Some of the results are within permissible limit and while some other exceeded. These results come in good agreement with those reported in similar studies and are below the international tolerance levels. The relative fluctuation in data obtained in each investigated element level reflects the different environment, food, culture, age, and habits.

Results of hematological parameters and clinical chemistry: For hematology and clinical chemistry endpoints, blood from traffic warden was collected into a micro-container tube containing EDTA, which kept the blood from coagulating. Once collected, samples were sent overnight to the emergency diagnostic laboratory of mayo hospital in Lahore for hematology and clinical chemistry analysis (**Table 4**). The blood chemistry depending upon the normal values are commonly monitored in human to have an access over the nutritional values, monitor diseases and health related to species. The nutritional values and blood chemistry is differ in different species and can be influenced by habitat, environment's, season and physiological status of organisms. In order to obtained information pursuing valuable diagnostic meaning of hematological values in human that may have great importance. These values are extensively studied to get information regarding the immune status of human. The blood profile plays a great role in diagnosis of health status of individual. Reading was noted after finishing the examination of blood samples for their hematological and clinical chemistry. Medical chart was retrieved from emergency lab of Mayo hospital Lahore with help of staff and data was studied and analyzed statically on Microsoft excel window 10 program presented as mean ± SEM in **Tables 5 and 6**. But no statistically significant changes in hematological endpoints were observed in CBC parameter except than lymphocytes. Of the clinical chemistry endpoints measured in traffic warden exposed to high level of zinc and iron reported in blood samples from air pollution only blood urea levels were statistically significantly increased and the result are presented in **Table 4**.

Table 4: The hematological profile of traffic wardens from twelve different area of Lahore city, Pakistan.

S. no	Sample code	Parameter of CBC					
		WBC	RBC	HGB	MCV	PLT	LYM
Units		10^3/UL	10^6/UL	g/dl	f L	10^3/UL	%
Normal range		4.5-11	4.3-5.9	13.5-17.5	80-100	150-300	15-50
1	ASI	8.7	6#.55	18.5	82.1	160	48
2	AS3	12.8	5.59	12.3	66.9	277	16.9
3	AL1	13.2	5.56	12.3	67.1	284	16.6
4	AL3	10	4.71	9.7	66.9	378	26.1
5	AR1	4.6	5.07	15.03	89	172	51.4
6	AR3	4.7	5.08	14.03	88.4	183	52.3
7	BY1	9	4.41	10.3	72.8	410	3.9
8	BY3	5.9	5.63	15.7	78.7	95	4.3
9	BK1	6.3	5.6	15.7	78.6	101	3.4
10	BK3	10.5	5.62	15.6	86.1	207	6.2
11	BM1	4.9	5.39	16.4	87.6	94	1.9
12	BM3	6.7	5.78	15	87.5	93	1.8
13	CP1	9.3	5.06	15.5	87.5	142	5
14	CP3	6	5.25	14.6	85	83	2.5
15	CE1	3.6	4.2	12	93.8	107	1
16	CE3	9.3	7.18	9.3	45.3	802	4.6
17	CG1	17.3	6.69	19.9	86.4	110	1.5
18	CG3	12.1	7.77	22.4	86.5	121	6.5
19	DT1	6	6.02	15.3	74.6	82	4
20	DS1	6.1	5.39	16.4	90.4	103	4.1

Table 5: Statistical reports of hematological profile from twelve different area of Lahore city, Pakistan.

Parameter	Normal range	Units	Mean ± SME	Range
WBC	4.5–11	10^3 µl	8.35 ± 0.79	13.7
RBC	4.3–5.9	10^6 µl	5.627 ± 0.2	3.57
HGB	13.5–17.5	g/dl	14.79 ± 0.73	13.1
MCV	80–100	fL	80.06 ± 2	48.5
LYM	15–50	% age	13.1 ± 3.8	51.3

Table 6: Statistical reports of RFT's, LFT'S and cardiac enzymes of traffic wardens from twelve different area of Lahore city, Pakistan.

Parameters	Normal range	Units	Mean ± SEM	Range
		RFT's		
B. Urea	10–50	mg/dl	53.8 ± 2.97	59
S/Creatinine	0.6–1.4	mg/dl	0.98 ± 0.07	1.1
BUN	7–20	mg/dl	13.39 ± 1.47	18.2
		LFT's		
Bilirubin	0–1.2	mg/dl	0.98 ± 0.14	2.56
SGPT (ALT)	10–40	U/L	25 ± 2.2	34
Alkaline phosphates	30–120	U/L	81.15 ± 6.3	107
		Cardiac enzymes		
CPK	0–171	U/L	139.7 ± 5.63	131
LDH	0–248	U/L	199.3 ± 9.38	154

CONCLUSION

It was concluded that trace metals may have adverse health impacts among traffic wardens of Lahore region. This study provided the baseline information regarding the presence of trace metals among occupationally exposed traffic wardens and its toxic effects on them. Outcomes of these findings could help the policy makers and government agencies to make laws and launch protective measures to mitigate the effects of trace metals on human health. It is hoped that the provincial environmental protection agencies will come out of hibernation, because assessing to the exposure of urbanites in Pakistan require continuous research studies and remedial measures as matter of priority and urgency.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Sebastiampillai BS, Navinan MR, Guruge SI, Wijayaratne DR, Dissanayake BS, et al. (2015) Lead toxicity among traffic wardens: A high risk group exposed to atmospheric lead, is it still a cause for concern?. J Occup Med Toxicol. 10:1-4.
2. Mishra S, Bharagava RN, More N, Yadav A, Zainith S, et al. (2019) Heavy metal contamination: An alarming threat to environment and human health. Environ Biotech Sustainable Future. 2019:103-125.
3. Ali H, Khan E, Ilahi I (2019) Environmental chemistry and ecotoxicology of hazardous heavy metals: environmental persistence, toxicity, and bioaccumulation. J Chem. 2019:1-14.
4. Fu Z, Xi S (2020) The effects of heavy metals on human metabolism. Toxicol Mech Methods. 30(3):167-176.
5. Shahid I, Alvi MU, Shahid MZ, Alam K, Chishtie F. Source apportionment of PM10 at an urban site of a South Asian mega city. Aerosol Air Qual Res. 18(9): 2498-2509.
6. Habibi H, Sobhanardakani S, Cheraghi M, Lorestani B, Sadr MK (2022) Analysis, sources and health risk assessment of trace elements in street dust collected from the city of Hamedan, West of Iran. Arabian J Geosci. 15(2):168.
7. Chen L, Zhou S, Wu S, Wang C, He D (2019). Concentration, fluxes, risks, and sources of heavy metals in atmospheric deposition in the Lihe River watershed, Taihu region, Eastern China. Environ Pollut. 255:113301.
8. Ali MU, Liu G, Yousaf B, Ullah H, Abbas Q, et al. (2019) A systematic review on global pollution status of particulate matter-associated potential toxic elements and health perspectives in urban environment. Environ Geochem Health. 41:1131-1162.
9. Rahman Z, Singh VP (2019) The relative impact of toxic heavy metals (THMs)(arsenic (As), cadmium (Cd), chromium (Cr)(VI), mercury (Hg), and lead (Pb)) on the total environment: An overview. Environ Monit Assess. 191(7):1-21.
10. Jain S, Barthwal V (2022) Health impact assessment of auto rickshaw and cab drivers due to exposure to vehicular pollution in Delhi: An integrated approach. Environ Sci Pollut Res Int. 29(4):5124-5133.

11. Li X, Liu B, Zhang Y, Wang J, Ullah H, et al. (2019) Spatial distributions, sources, potential risks of multi-trace metal/metalloids in street dusts from barbican downtown embracing by Xi'an ancient city wall (NW, China). Int J Environ Res Public Health. 16(16):2992.
12. Bisht L, Gupta V, Singh A, Gautam AS, Gautam S (2022) Heavy metal concentration and its distribution analysis in urban road dust: A case study from most populated city of Indian state of Uttarakhand. Spat Spatiotemporal Epidemiol. 40:100470.
13. Li C, Peng ZR (2022) Spatial distributions of particulate matter in neighborhoods along the highway using unmanned aerial vehicle in Shanghai. Building Environ. 211:108754.
14. Wang M, Tian P, Wang L, Yu Z, Du T, et al. (2021) High contribution of vehicle emissions to fine particulate pollutions in Lanzhou, Northwest China based on high-resolution online data source appointment. Sci Total Environ. 798:149310.
15. Chen H, Yan Y, Hu D, Peng L, Wang C (2023). High contribution of vehicular exhaust and coal combustion to PM2. 5-bound Pb pollution in an industrial city in North China: An insight from isotope. Atmosph Environ. 294:119503.
16. Javed W, Guo B (2021) Chemical characterization and source apportionment of fine and coarse atmospheric particulate matter in Doha, Qatar. Atmosph Pollut Res. 12(2):122-136.
17. Ravikumar N, Chegukrishnamurthi M, Gadde Venkata S (2022) Role of Micronutrients in Neurological Development. InRole of Nutrients in Neurological Disorders. Singapore: Springer Singapore. 177-199.
18. Rahim M, Ullah I, Khan A, Haris MR (2016) Health risk from heavy metals via consumption of food crops in the vicinity of District Shangla. J Chem Soci Pakistan. 38(1): 177-185.
19. Rashid S, Arshad M, Siddiqa M, Ahmad R (2018) Evaluation of DNA damage in traffic police wardens of Pakistan due to cadmium and zinc. Sci Total Environ. 630:1360-1364.
20. Bonilla DA, Moreno Y, Petro JL, Forero DA, Vargas-Molina S, et al. (2022) A bioinformatics-assisted review on iron metabolism and immune system to identify potential biomarkers of exercise stress-induced immunosuppression. Biomedicines. 10(3):724.