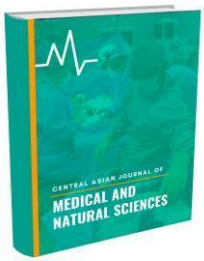

CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES
https://cajmns.centralasianstudies.org/index.php/CAJMNS
Volume: 05 Issue: 03 |July 2024 ISSN: 2660-4159

Determining the Blood Level of Lead of a Traffic Policeman in the Southern Governorates of Iraq

Sammah Naeem Ghazi*, Hadeer Hassan Habib, Hawra'a Raheem Abdul-Hussain, Ibrahim Nazim Shejar, Naba'a Hazem Galoob, Naba'a Kareem Nateash, Noura Ahmed Abdel-Zahra, Sajjad Oday Abbas

[1,2,3,4,5,6,7,8] Pharmacy Department, Al-Manara College for Medical Sciences, Maysan 62001, Iraq
* Correspondence: sammahchemistry@gmail.com

Abstract: In this study, blood lead levels (BLLs) were determined in the blood of traffic police in the southern governorates of Iraq (since they are more exposed to lead found in automobile gasoline) and compared with samples taken from the blood of people of the same gender and age, but who do not work in the same job and live in rural areas somewhat far from pollution. The blood lead levels (BLLs) were determined in all these samples after digesting them by concentrated acids, and a flame atomic absorption device was used for the determination . The results showed that the percentage of lead was higher than the normal value (25 µg/dl) in the blood of the traffic policeman, while most of the samples of the second group were less than (25 µg/dl). It was found that these percentages increase with increasing age, and their increase has also been observed in people who smoke.

Keywords: Heavy Metals, Lead , Traffic Policeman, Atomic Absorption Spectrophotometer.

Introduction

"Heavy metals" are a class of elements that have an atomic number greater than 20 and an elemental density greater than 5 g/cm3, all of which are concurrently found in nature. This classification classifies 51 elements in the periodic table as "heavy metals," omitting those like Al, As, Se, and Ti. It is known that more than 20 heavy metals can cause major health issues in people.[1] These heavy metals are transported and deposited into bodily tissues and cells. They bind to proteins, which are then broken down by nucleic acids, impairing the macromolecules' ability to operate as a unit. Therefore, the human body may experience a number of effects from heavy metal toxicity. It can harm blood components, the lungs, liver, kidneys, and other important organs, which can promote a number of disease conditions. It can also impair central nervous system function, which can result in mental disorders [2]. Furthermore, chronic heavy metal buildup in the body may slow down the course of degenerative processes affecting the muscles, nervous system, and body that resemble conditions like Parkinson's and

Citation: Sammah Naeem Ghazi, Hadeer Hassan Habib, Hawra'a Raheem Abdul-Hussain, Ibrahim Nazim Shejar, Naba'a Hazem Galoob, Naba'a Kareem Nateash, Noura Ahmed Abdel-Zahra, Sajjad Oday Abbas. Determining the Blood Level of Lead of a Traffic Policeman in the Southern Governorates of Iraq. Central Asian Journal of Medical and Natural Science 2024, 5(3), 655-664.

Received: 13th June 2024
Revised: 17th June 2024
Accepted: 19th June 2024
Published: 23th June 2024

Alzheimer's [2]. Furthermore, prolonged exposure to some heavy metals or their compounds over time can harm nucleic acids, induce mutations, and resemble hormones, which can upset the endocrine and reproductive systems and ultimately result in cancer.[3]

In a dry environment, lead is a brilliant silvery metal with a hint of blue. Drinking water, food, cigarettes, industrial operations, and home sources are the primary causes of lead exposure. Lead comes from various industrial sources such as gasoline, paint for homes, plumbing pipes, lead bullets, storage batteries, pewter jugs, faucets, and toys[4]. Both automobile exhaust and industrial activities release lead into the atmosphere. Because of this, lead may enter the ground and seep into bodies of water, where it may be absorbed by vegetation and cause human exposure to lead through food or water.[5] Because it is resistant to corrosion, metallic lead is not readily harmed by air or water. Thin layers of lead compounds are generated when exposed to air or water, shielding the metal from more damage. Molding and shaping lead is simple. Alloys can be created by combining lead with other metals. Lead and lead alloys are frequently found in shot and ammunition, weights, pipes, storage batteries, cable covers, and radiation shielding sheets. Lead is mostly used in storage batteries for automobiles and other vehicles [6].

Adult epidemiological research shows that PbB exposure is linked to impairments in brain function. Peripheral neuropathy, mental symptoms (depression, anxiety, hostility, confusion, aggression, and schizophrenia), and alterations in regional brain sizes and neurochemistry are among the other neurotoxic consequences that have been noted at greater PbB levels (>30 μg/dL). A few studies that have tracked children into their early adult years have found a link between behavioral and neuroanatomical changes in adults and childhood PbB levels, which raises the possibility that childhood exposures may have an impact on adult outcomes.[7]

Materials and Methods

Instrumentation

Flame atomic absorption spectroscopy, Aurora, AI-1200, Fume Hoods,Hot plate.

Sample collection

30 blood samples were collected from the traffic policeman in the following Checkpoints (Checkpoint of the martyr Colonel Ali Salman and Oil checkpoint.) in Maysan province and 30 blood samples were collected

from people who do not work as a passage of same gender and reconstruction.

Biological Sample digestion

Nitric acid is rarely used alone. It is best used in combination with sulfuric and/or perchloric acids for sample digestion. This procedure is intended for the determination trace metals (excluding Hg , The only element that may be lost from a nitric/perchloric digestion is Hg) in biological tissues and biological liquids involved in biologically related tests (such as skin absorption and inhalation studies)[26]. This method is applicable for the determination of trace metals down to the ppm concentration level . The samples were digestion by adding (10mL) of mixture containing (HNO3:HCIO4) mixed at 4:2 ratio to (0.5mL) serum in beaker 10 mL, heated at (120 °C) by a hot plate, until the volume became (1mL) and clear (if it is not, it must be filtering), cooling to room temperature [8].

Preparation Stock Solution of Lead (II) (1000 μg/mL)

Lead nitrate Pb(NO3)2 (0.1598 g) was quantitatively transferred to a volumetric flask (100 mL) and filled to the top with deionized water after being dissolved in a little amount of 5% HCl in a beaker. Stock solution was serially diluted to create the working standard solutions. The weight was determined by applying Equation (1) below[25].

$$m = \frac{ppm}{1000} x \frac{M.wt}{Atomic\ mass\ of\ the\ element\ x\ Number\ atoms\ of\ element} x \frac{V(ml)}{1000}.$$

Determination of Calibration Curves for pb+2 by Flame Atomic Absorption Spectroscopy

To determine the calibration curve for lead(II) ion, a series of standard solutions were prepared at various concentrations (2,4,6 and 8ppm) for (Pb+2), and then the absorption (Absorbance) was measured at the greatest wavelength for lead ion pb+2 (λ max=217 nm) and applying Beer - Lamberts Law Which represents the relationship between absorption and concentration, and through th values obtained, it was obtained, on the standard calibration curve as shown in the Figure(1) below

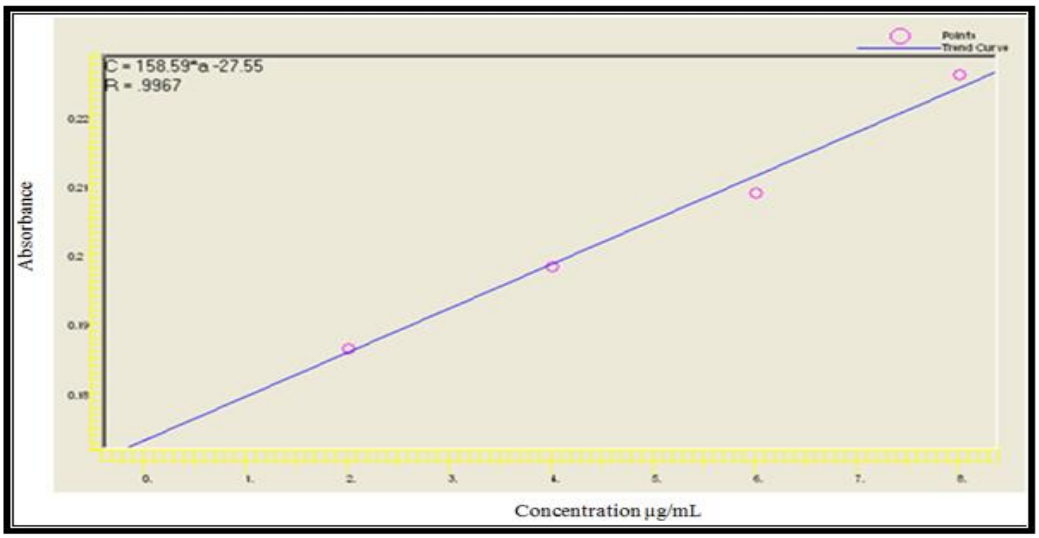

Figure 1. Standard calibration curve of pb+2 by Flame atomic absorption spectroscopy

Preparation of samples solutions

After digestion, each sample is transferred to a 25 ml volumetric flask, diluted with deionized water up to the mark. Then the lead concentration in each sample is measured using Flame atomic absorption spectroscopy device after performing the calibration process using diluted solutions of the lead solution[24].

Results

To determine whether the blood lead levels (BLLs) of thirty traffic police officers from the Maysan Governorate would correspond with the reported high atmospheric lead levels, BLLs were measured using a flame atomic absorption spectrophotometer[23]. in Iraq's southern governorates. The study population consisted of male employees aged between 30 and 59 year ,who completed questionnaires on their age, length of service, and whether or not they were smokers. The values extracted from the blood of urban traffic police officers are displayed in Table No. ().

Table 1. shows blood lead levels in different units for smoking and non-smoking traffic police officers of different age groups

Sample Number	The Age	Length of Service	Smoker	Blood Lead Levels (µg/ml)	Blood Lead Levels (µg/dl)
1	57	15	YES	0.36	36
2	43	18	NO	0.26	26
3	50	30	NO	0.33	33
4	48	30	YES	0.275	27.5
5	50	19	NO	0.28	28
6	47	18	YES	0.34	34
7	40	19	YES	0.315	31.5
8	45	19	NO	0.227	22.7
9	43	18	NO	0.251	25.1

10	43	16	NO	0.265	26.5
11	48	18	YES	0.3	30
12	51	33	YES	0.33	33
13	51	20	YES	0.37	37
14	55	20	YES	0.32	32
15	39	16	YES	0.22	22
16	55	30	YES	0.37	37
17	44	15	NO	0.22	22
18	57	20	NO	0.27	27
19	54	18	YES	0.33	33
20	40	24	YES	0.35	35
21	46	15	YES	0.25	25
22	46	34	YES	0.26	26
23	36	13	YES	0.199	19.9
24	45	18	NO	0.23	23
25	30	11	YES	0.24	24
26	46	18	YES	0.27	27
27	52	17	NO	0.29	29
28	47	22	YES	0.29	29
29	45	20	NO	0.27	27
30	50	17	YES	0.33	33

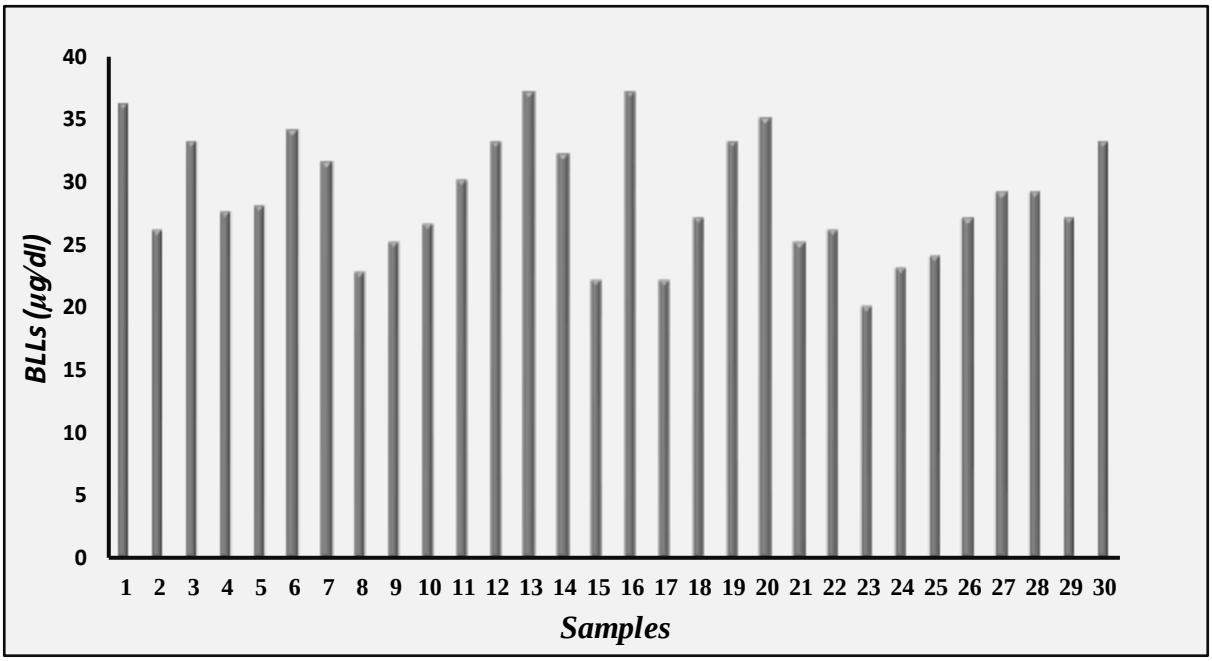

Figure 2. shows BLLs in micrograms per deciliter in the blood of a traffic policeman

Additionally, using the same atomic absorption technique, the blood lead levels (BLLs) of thirty individuals who shared the same gender and age range as the first group but did not work in the same profession and lived in a rural area somewhat removed from pollution were also examined[22]. The values from the blood of controls who reside in rural areas are displayed in Table No [21].

Table 2. shows blood lead levels in different units for smoking and non-smoking control of different age groups

Control sample	The Age	Smoker	Blood Lead Levels (µg/ml)	Blood Lead Levels (µg/dl)
1	38	YES	0.16	16
2	21	NO	0.09	9
3	31	NO	0.12	12
4	54	YES	0.13	13
5	30	NO	0.124	12.4
6	55	YES	0.19	19
7	45	YES	0.12	12
8	43	NO	0.1	10
9	32	NO	0.095	9.5
10	50	NO	0.11	11
11	51	YES	0.13	13
12	55	YES	0.15	15
13	47	YES	0.167	16.7
14	40	YES	0.18	18
15	36	YES	0.103	10.3
16	51	YES	0.173	17.3
17	59	NO	0.12	12
18	50	NO	0.12	12
19	48	YES	0.13	13
20	40	YES	0.14	14
21	44	YES	0.13	13
22	55	YES	0.132	13.2
23	39	YES	0.102	10.2
24	45	NO	0.113	11.3
25	46	YES	0.09	9
26	54	YES	0.157	15.7
27	50	NO	0.135	13.5
28	50	YES	0.142	14.2
29	50	NO	0.122	12.2
30	45	YES	0.145	14.5

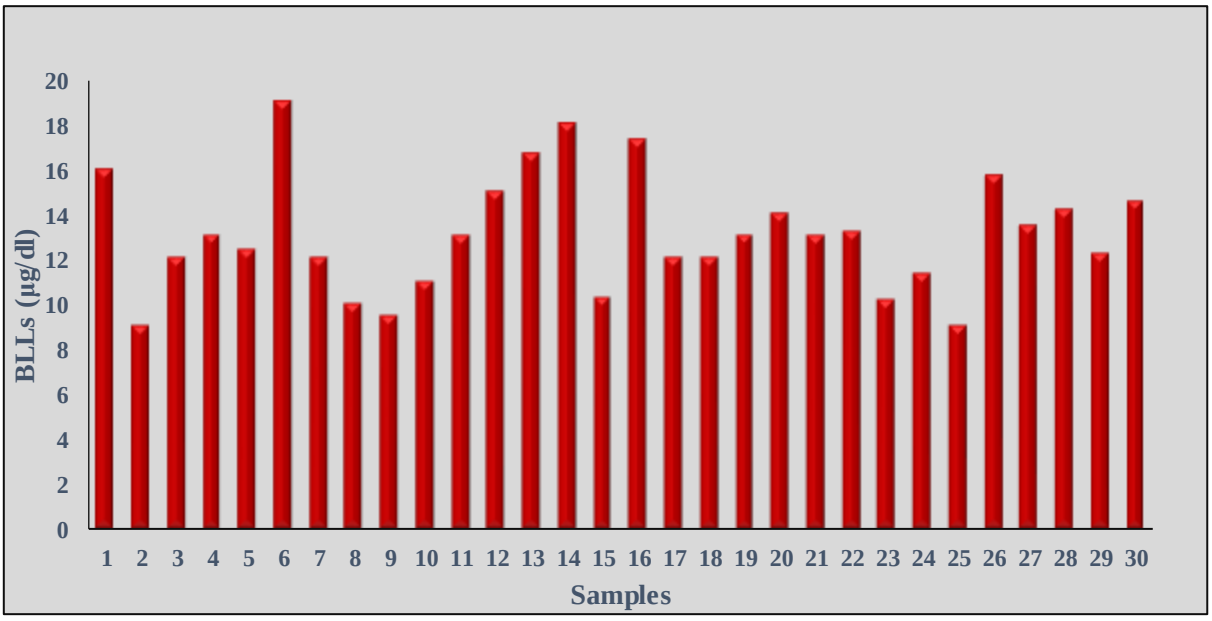

Figure (3). The analysis of Values obtained from the blood of controls who live in a rural area

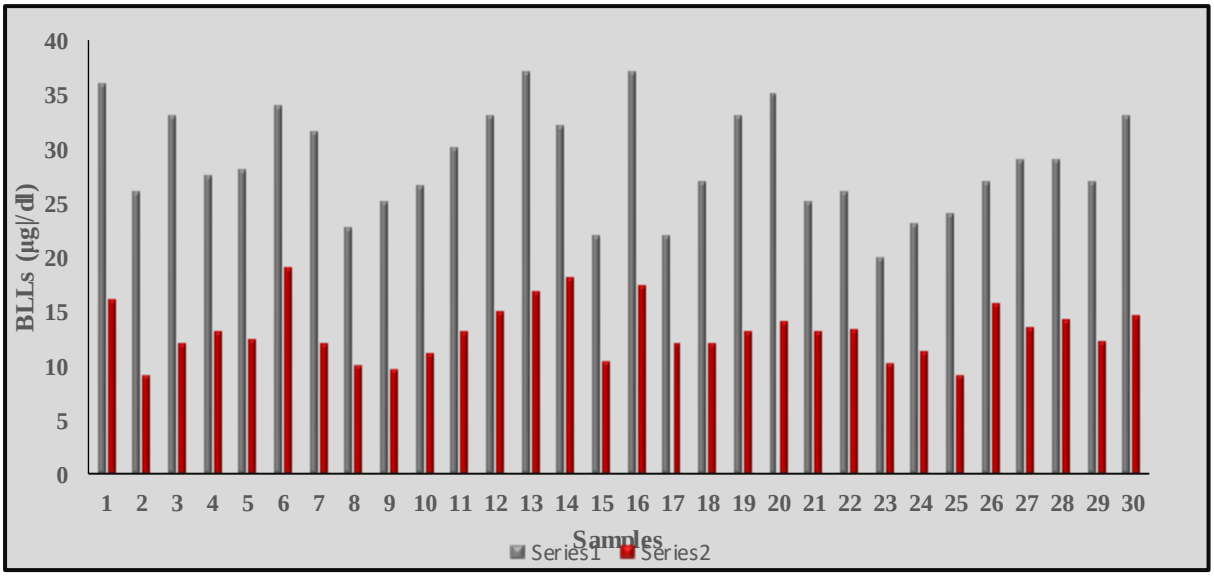

Figure 4. Analytical chart showing the difference between the samples of the two groups. It shows a difference in lead concentrations in the serum of traffic police compared to rural residents. Series1; Traffic police, Series2; Rural.

The following is demonstrated by the values in the tables and figures.The traffic policemen's blood lead levels (BLLs) ranged from 22 to 33, with a mean value of 28.7 ug/dl. Six of the thirty people that were tested had blood lead levels below 25 ug/dl, while 24 of these subjects had blood lead levels between 25 and 33 ug/dl[20].

Discussion

In an urban environment, burning leaded gasoline is the primary source of lead exposure for the general public, however there are other potential sources as well, like industrial contamination.high lead levels in the general population in places with significant traffic and crowding, such as leaded gasoline[19].This study's tendency toward increasing lead exposure with age is consistent with findings from earlier local research on Iraqi adults in the provinces of Basra and Baghdad who were exposed to lead both occupationally and non-occupationally [8-10].

The present investigation examines how the blood lead levels of workers are impacted by their work habits and how long they have been exposed to lead at work (duration of employment). Workers' blood lead concentrations are significantly greater than those of the non-exposed control group and police males.The majority of workers are unaware of the harmful effects of the metal they are exposed to, so they don't take the necessary precautions to protect themselves from potentially ingesting or inhaling the toxic substance. Nor are they informed about the issue.

[11] The findings of our study are in line with those of earlier research projects that determined the BLLs of Nigerians exposed to both occupational and non-occupational risks as well as workers in a range of jobs in the United Arab Emirates. [12-14].

According to our findings, longer exposure times at work are linked to greater BLLs; these findings are consistent with those of previous studies [1, 15]. According to the current study, tobacco use is substantially linked to elevated BLLs. Value, this result is consistent with other studies' findings [16.17]. There is ongoing debate on the specific causes and workings of the overexposure of smokers. Lead intake through increased hand-mouth contact or the easier passage of airborne lead particles into the lungs by smoke particles are two possible causes[18].

Conclusion

Workers in many jobs in Mysan City have high blood lead concentrations, and traffic police officers are particularly vulnerable to lead poisoning. The BLLs of traffic cops are impacted by their work-related behaviors and are correlated with factors like age, smoking, and length of employment. There is an immediate need for more extensive screening to lessen the negative impacts of lead exposure.

References

1. Adela Y, Ambelu A, Tessema DA. Occupational lead exposure among automotive garage workers – a case study for Jimma town, Ethiopia. Journal of Occupational Medicine and Toxicology; 2012: 7:1531.
2. Ahmed K, Engidawork AG. Lead exposure study among workers in lead acid battery repair units of transport service enterprises, Addis Ababa, Ethiopia: a cross-sectional study. Journal of Occupational Medicine and Toxicology; 2008: 3:30
3. Alanee SA. Blood Lead Levels in Non-occupationally Exposed Individuals Contacting the Specialized Surgeries Hospital in 2008. Tikrit Medical Journal; 2011, 17(2): 17-21.
4. Al-Dosky AH, Al-Timimi DJ, Al-Dabbagh SA. Occupational exposure to lead in Duhok city, Kurdistan region, Iraq. Duhok Medical Journal; 2011: 5(2):76–85.
5. Atsdr, "Toxicological Profile for Lead," 2020.
6. Berner A, Almehdi AM, Alwash R, Al-Neamy. FRM: A pilot survey of blood lead levels in various types of workers in the United Arab Emirates. Environmental International; 2001: 27:311-314.
7. Falq G, Zoghnoun A, Pascal M, Vemay N, et al. Blood lead levels in the adult population living in France. The French Nutrition and Health Survey (ENNS 2006–2007). Environment International;2011: 37(3): 565–571.
8. Fatoki OS, Ayoade D: Leady assay in blood of occupationally and non-occupationally exposed. International Journal Environmental Health Research; 1996: 6(3):195-200.
9. H. Ali and E. Khan, "What are heavy metals? Long-standing controversy over the scientific use of the term 'heavy metals'–proposal of a comprehensive definition," Toxicological and Environmental Chemistry, vol. 100, no. 1. Taylor and Francis Ltd., pp. 6–19, Jan. 02, 2018. doi: 10.1080/02772248.2017.1413652
10. Jarup L, "Hazards of heavy metal contamination," Br Med Bull, vol. 68, no. 1, pp. 157–182, 2003.
11. Mason H, Williams N. The decay of blood lead levels in workers suspended under the control of lead at work regulations. Occupational Medicine; 2005: 55(5):371-374.
12. Monisha J, Tenzin T, Naresh A, Blessy BM, and Krishnamurthy NB, "Toxicity, mechanism and health effects of some heavy metals," Interdiscip Toxicol, vol. 7, no. 2, pp. 60–72, 2014.
13. Stoleski S, Stikova E, Bistimovska JK, Mijakoski D. Biological Monitoring Among Workers Exposed to InorganicLead and Its Compounds. Macedonian Journal of Medical Sciences; 2011: 4(4):428-436.
14. Thurmer K, Williams E, and Reutt-Robey J, "Autocatalytic oxidation of lead crystallite surfaces," Science (1979), vol. 297, no. 5589, pp. 2033–2035, 2002.
15. U.S. Department Of Health And Human Services (Public Health Service), "Toxicological Profile For Lead," 2007.
16. Wani AL, Ara A, and Usmani JA, "Lead toxicity: A review. Interdisciplinary Toxicology," vol. 8, no. 2, pp. 55–64, 2015.
17. Weyermann M, Brenner H. Alcohol consumption and smoking habits as determinants of blood lead levels in a national population sample from Germany. Archive of Environmental Health: 1997: 57: 233–239.

18. Wietlisbach V, Rickenbach M, Berode M, GuilleminM. Time trend and determinants of blood lead levels in a Swiss population over a transition period (1984–1993) from leaded to unleaded gasoline use. Environmental Research; 1995: 68: 82–90.
19. Amarasinghe, J. N. P. (n.d.). Blood lead levels of traffic policeman in the city of Colombo. PGIM Theses and Dissertations 2002.
20. Amarasinghe, J. N. P. (2011). Blood lead levels of traffic policeman in the city of Colombo. … Lead Levels of Traffic Policeman in the City …. https://pesquisa.bvsalud.org/portal/resource/pt/sea-127967
21. Ghazi, S. N., Habib, H. H., Shejar, I. N., & ... (2024). Determining the Blood Level of Lead of a Traffic Policeman in the Southern Governorates of Iraq. Journal of Science …. https://journals.proindex.uz/index.php/JSML/article/view/938
22. GONG, J., CHEN, K., & ZHANG, F. (2005). Analysis on insular traffic policeman healthy risk and related affecting factors. Chinese Journal of Public Health. https://www.zgggws.com/en/article/id/15850?viewType=HTML
23. Kanjanasiranont, N., Prueksasit, T., & Morknoy, D. (2017). Inhalation exposure and health risk levels to BTEX and carbonyl compounds of traffic policeman working in the inner city of Bangkok, Thailand. Atmospheric Environment. https://www.sciencedirect.com/science/article/pii/S1352231016309529
24. Khan, S. T., Karadkhedkar, S., & Khadkekar, S. (2014). Noise induced hearing loss in city traffic policeman. Research &Reviews: Journal of Medical …
25. Liu, K. J., & Zhong, H. (1994). Effect of occupational hazard on neurobehavioral functions of traffic policeman. Chin J Indust Med.
26. MJ, P. A. S., MT, S. B., & MY, N. A. D. (2019). Mobile Outdoor Air Wireless Sensor Network for Exposure Monitoring among Traffic Policeman: A Review. Malaysian Journal of Medicine …. https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=16758544&AN=141975225&h=L658MLGKg7%2Fzmj3uNJF0LcrmuHhIhPzq056JVvko36RG6jbZ4oaaRrklRqJD0oSVTC82Tq1zEuRfEqGeNtbPFg%3D%3D&crl=c
27. Nurai, T., & Naqvi, W. (2021). A research protocol of foot posture evaluation in traffic policeman. researchsquare.com. https://www.researchsquare.com/article/pex-1420/v1
28. Nurai, T., & Naqvi, W. (2022). A research protocol of foot posture in traffic policeman. Journal of Datta Meghe Institute of Medical …. https://journals.lww.com/dmms/fulltext/2022/17010/A_Research_Protocol_of_Foot_Posture_in_Traffic.8.aspx
29. Singh, A., & Choudhary, A. (2023). Traffic Policeman Gesture Recognition With Spatial Temporal Graph Convolution Network. 2023 IEEE Conference on Artificial …. https://ieeexplore.ieee.org/abstract/document/10195048/
30. Vešović, M. (2003). Christ the Traffic Policeman. DIWAN. https://www.ceeol.com/search/article-detail?id=93049
31. Williams, S. (2017). Traffic Policeman Desperately Clings to Car's Bonnet after Driver Refuses to Stop for an Inspection and Accelerates Straight into the Officer.'. Daily Mail.