

## Lead and Cadmium (Pb, Cd) Levels Determination in the Blood of the Gasoline Station Workers

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**Abstract:** The inhalation of hazardous fumes from lead containing gasoline in the workplace has become a major public health concern. These gases include extremely dangerous poisons that can induce aberrant changes in the functioning of a variety of essential organs. The current study aimed to estimate the concentration of blood lead level (BLLs) and blood cadmium level in male working gasoline station and compared with healthy people. An atomic absorption spectrophotometer (AAS) was used to measure cadmium and lead levels in the blood. The findings of this investigation revealed that there was significant increase in age ( $P$ -value = 0.002), mean age of worker station ( $32.0 \pm 11.99$ ) while in the control group ( $22.85 \pm 2.18$ ), the result of blood lead level shown ( $1.92 \pm 1.54$ ) in gasoline station while in the control group ( $1.63 \pm 0.04$ ) no significant differences was observed ( $P$ -value = 0.238). The main of blood cadmium level was  $0.005 \pm 0.0069$  in the gasoline station while in the control group ( $0.069 \pm 0.011$ ) no significant differences were observed ( $P$ -value = 0.5), the smokers ( $n=13$ ) has ( $P > 0.426$ ) mean BLL ( $21.60 \pm 12.88$   $\mu\text{g/dL}$ ), while non-smoking workers ( $n = 8$ ) the BLL mean was  $15.52 \pm 6.80$   $\mu\text{g/dL}$ . The results also show that there is a correlation between age and blood lead level while no correlation was observed in blood cadmium level.

**Key word:** Gasoline worker, lead toxicity, cadmium.

### Introduction

Heavy metals like lead (Pb) and cadmium (Cd) can both cause serious concerns with people's health, particularly those who are exposed to them at work. Cd is a hazardous element that can be discharged into the environment because of the activities of humans like using phosphate fertilisers with cadmium-containing batteries, burning electronic waste, and cigarette smoking (Alli, 2015). Gasoline, often known as petrol, is a man-made substance that does not occur naturally in the environment. It is largely made up of several hundred hydrocarbons with boiling temperatures ranging from  $40^{\circ}\text{C}$  to  $180^{\circ}\text{C}$  that are obtained by fractional distillation of petroleum (Li, 2007).

Lead (Pb) is a dangerous environmental pollutant and one of the oldest chemical poisons. Even though lead is one of the most valuable industrial materials, it is also one of the most toxic metals; it has no functional purpose in the human body, and it is not biodegradable in nature, so it will remain in circulation once released into the environment (Azize, 2018). While it is naturally occurring, various industrial activities such as manufacture of batteries, paints, and varnishes as an antidetonation agent in gasoline can cause it to be discharged into the environment (Karrari et al., 2012).

Cd is exceedingly poisonous with no recognised function of the body. Cadmium toxicity contributes to many health conditions such as cardiovascular disease, cancer, and diabetes, certain organs, and

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tissues, such as the liver, spleen, pancreas, heart, and kidneys also absorb this metal, which is disseminate with the targeted metal concentrations (Nabulo et al., 2006). Toxicity is increasing today in foods and its use in different industries, cement, smoking, mining, and smelting, production of batteries (Ni-Cd), welding and soldering, production of pigments, and other synthetics, etc. Volcanic eruptions are used as a covering for iron, steel, and copper, as well as a stabiliser in rubber and plastics, cigarette papers, and a variety of other items. As a result, this metal may damage water, air, and food in these businesses (Sharma et al., 2015).

Breathing fumes at a gas station, filling up a car's tank, operating gasoline-powered machinery, using a snow blower, drinking contaminated water, or being near a gas station, where gasoline has spilled or sunk into the soil are all examples of ways to be exposed to gasoline. Certain workers are at a higher risk of inhaling gasoline vapours. Drivers of gasoline tank trucks are among the employees at service stations, workers at bulk loading terminals and docks, workers who remove and maintain underground storage tanks and gasoline pipelines, workers who discover and clean up gasoline spills and leaks, and refinery workers (Al-Fartosy et al., 2017).

### Material and Method

The present study was conducted in Hilla city-Iraq from September 2021 to February 2022. The main objective of the study was to identify the risk variables related to the exposure of lead and cadmium, present in gasoline and cadmium to employees of gas station in Hilla. Data were collected via questionnaires, as well as blood samples were collected, prepared, and stored in this study. Participants were given advance notice of the study's purpose, and their participation was voluntary. This study included 21 blood samples filling-pump employees, who were chosen at random from 10 petrol stations in Hilla city. With an average age of  $31 \pm 10$  years, an average service time in gas stations of  $13.6 \pm 10.7$  years, and a daily average of work time about 8 h. Age, work hours, safety precautions, and smoking were all included on the questionnaire present for each respondent. As a control group, twenty persons with an average age  $45 \pm 10$  years were recruited for the general people of Hilla locals with little or no experience of working at gasoline stations and who matched the study group in age and gender.

1. A forearm vein was used to collect approximately 5 ml of blood from each fasting worker in the fuel

station and control persons, then added to gel tubes and gently shaken before centrifugation to extract serum for measuring Pb and Cd concentration.

2. Digestion step, serum was transferred and addition of nitric acid.
3. Flame atomic absorption spectrometry (AAS) was used to determine the amounts of bp and cd in standards and sample solutions (GBC 933 Plus).

### Statistical Analysis

The data were statistically analysed using Version 18, SPSS Ince, Chicago, Student's t-test. The results are presented in tables as (mean values and standard deviations). At  $p = 0.05$ , statistical significance was assumed, and at  $p = 0.011T$ , it was assumed to be very significant.

### Result and Discussion

Twenty one workers from 8 locations agreed to provide blood samples for BLL, and Cd levels. In general, the stations' preventive measures were minimal or non-existent. This, in turn, may have a role in the emergence of health complaints among some employees. Respiratory difficulties, including dyspnea, weariness, cough, irritation, red eyes, and headache, were the most often self-reported health symptoms. It's worth noting that the bulk of these issues surfaced following a period of working at a gas station. The result of current study explains there was significantly increase in age ( $P$ -value = 0.002), mean age of worker station ( $32.0 \pm 11.99$ ) while in the control group ( $22.85 \pm 2.18$ ), the main of worker station of cadmium ( $5.02 \pm 4.86$ ) vs ( $6.85 \pm 11.21$ ) and there are no significant differences, also lead level not significantly different observed as shown in Table 1.

**Table 1: The main variable of worker station and control group**

Variable	Worker (Mean $\pm$ SD)	Control (Mean $\pm$ SD)	Sig
Age	$32.0 \pm 11.99$	$22.85 \pm 2.18$	0.002*
Duration	$13.61 \pm 0.71$	-	-
Cd	$5.02 \pm 4.86$	$6.85 \pm 11.21$	0.5
Pb	$1.92 \pm 1.54$	$1.36 \pm 0.04$	0.238

Hilla City is experiencing major environmental and occupational issues that are only becoming worse. Workers at gas stations are constantly exposed to a variety of toxic poisons and unpleasant gases, with lead

and benzene fumes being among the most dangerous (Mitra et al., 2009). They are linked to hematological cancers, particularly acute nonlymphocytic (myeloid) leukemia, are at an increased risk, and they can induce aberrant changes in the functioning of several important organs (Khan et al., 2013).

The studied sample result of workers showed, the smoker ( $n=13$ ) has ( $P > 0.426$ ) the mean of blood Pb levels was ( $21.60 \pm 12.88 \mu\text{g/dL}$ ), while non-smoking workers ( $n=8$ ) the mean of BLL ( $15.52 \pm 6.80 \mu\text{g/dL}$ ). As shown in Table 2 our results are in agreement with studies conducted by Babalola et al. (2005) who found the highest blood level in gasoline station workers than in non-workers. Continuous usage of lead gasoline from automobiles (Musa et al., 2011; Omokhodion, 1994) may contribute to automobile mechanics' and fuel attendants' relatively high blood lead levels as compared to another group. Car technicians have poor work habits, such as while working, sucking gasoline-gasoline with the tongue, could possibly play a role in the high levels of blood lead. Other sources of Pb (for both exposed and non-expository people) included open-air trash burning without discrimination, Batteries, abandoned tires, industrial/agricultural trash, and other lead-based goods are examples.

Other impacts of exposure to lead with cigarette smoke on DNA damage and spermatozoa demonstrated that the high daily consumption of cigarettes was associated with higher BLL among smokers. The study's key finding is that there is a significant difference between blood Pb level and the quantity of spermatozoa in workers exposed to lead that are more susceptible to DNA denaturation and morphologic abnormalities. Furthermore, the fraction of sperm that produces too much oxygen is linked to chromatin DNA denaturation in the sperm (Hsu et al., 2009).

The smoker ( $n=13$ ) has  $P > 0.426$  the mean of BLL was  $21.60 \pm 12.88 \mu\text{g/dL}$ , while non-smoking workers ( $n=8$ ) the mean of BLL was  $15.52 \pm 6.80 \mu\text{g/dL}$ . Many previous studies indicated that high levels of heavy metals can lead to chronic interstitial nephritis, with BLLs of more than  $61 \text{ mg/dL}$  being the most prevalent (Pranjić et al., 2002). Kidney ageing is connected to previous lead poisoning, the overall duration of lead exposure, and age as a crucial confounding variable (Odigie et al., 2004). Chronic, recurring lead poisoning with a correspondingly growing lead burden in the body might impair renal function and, as a result, humoral immunity may decrease. Chronic kidney damage was identified in 10 of 38 of the longest-term lead-exposed

**Table 2: Mean of Pb with some variable in study group and control groups**

Group variable	N	Control (bp) (Mean $\pm$ SD) <i>n</i> = 20	Sig	N	Workers (Mean $\pm$ SD) <i>n</i> = 21	Sig
Smoking						
Yes	15	15.52 $\pm$ 48.57		13	21.60 $\pm$ 12.88	.426
No	5	1547.82 $\pm$ 48.19	0.551	8	15.52 $\pm$ 6.80	
Occupational status					15.55 $\pm$ 6.80	
Employed	4	15.03 $\pm$ 4.63		11	23.39 $\pm$ 2.378	.287
Non-employed	16	15.47 $\pm$ 4.81	0.120	10		

**Table 3: Mean of Cd with some variable in study group and control groups**

Group variable	N	Control (Mean $\pm$ SD) <i>n</i> = 20	N	Workers (Mean $\pm$ SD) <i>n</i> = 21
Smoking				
Yes	15	8.07 $\pm$ 1.28	13	3.84 $\pm$ 1.55
No	5	3.22 $\pm$ 0.60	8	6.93 $\pm$ 3.25
Sig		0.417		0.162
Occupational status				
Employed	4	16.14 $\pm$ 2.48	11	6.03 $\pm$ 3.94
Non-employed	16	4.53 $\pm$ 2.68	10	3.91 $\pm$ 1.27
Sig		0.062		0.331

employees, and proteinuria in 6 of 37 (Mohammed, 2010).

The results show a positive correlation between age and cadmium level ( $P = 0.006$ ), and there is no correlation between cadmium blood levels among the study group. The higher cadmium levels found in non-occupationally exposed people in there, and earlier research are concerning (Al-Jubouri and Bashbosh, 2012; Ahmed, 2016; Al-Terehi et al., 2021) are indicative of the degree of cadmium pollution in the environment. This is severely worrisome since it suggests that healthy people, regardless of their occupation, are exposed to cadmium from the environment.

Certain trace elements are necessary for the human body to properly function. These elements must be present in sufficient amounts in the body and capable of combining with other elements to produce important compounds, as well as taking part in a range of important chemical reactions. Workers at petrol stations may have lower Se levels in their blood linked to higher (ROS) oxidative stress, necessitating an increase in the Se helps to detoxify tissue peroxidation by acting as an antioxidant by binding with vitamin E and as a cofactor of GPx to scavenge free radicals (Al-Helaly and Ahmed, 2014).

Heavy metals are substances that are consumed and absorbed by the body and are commonly found in the air in the workplace, posing a possible health concern to workers. Pb and Cd levels in employees may be high as a result of inhaling contaminated air, eating contaminated meals, or engaging in unsafe work practices. For example, not washing polluted hands, entering the body through the skin, and not wearing protective gear. Additionally, increased levels of Cd in smoking during occupational exposure, as well as a deficiency in iron, calcium, and protein in the body, enhance Cd absorption and hence raise Cd concentration in the body, causing lipid peroxidation and a range of disorders by boosting free radicals ROS.

In conclusion, the BLLs and Cd levels in both occupationally exposed and non-exposed patients in this current study were found to be over the permissible threshold, leading to the risk of posing health. The obtained data were found to be in higher ranges for cadmium (Cd) and lead (Pb), which are 0.04–0.13 g/dL and 0–11 g/dL, respectively.

To avoid inhaling heavy metal fumes, we highly advise staff on duty to wear protective face masks. Occupationally exposed workers should also wash their hands and face before eating, shower before leaving work, and not wear their work clothing at home.

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## Contents

<i>Editorial</i>	i
❑ <i>Snapshots</i>	ii
The Ability of <i>Dracaena marginata</i> var. <i>tricolor</i> , <i>Gratophyllum pictum</i> , and <i>Pedilanthus tithymaloides</i> as Lead Absorbents in the Air <i>K. Sahani and F. Rachmadiarti</i>	1
Investigation of Shadowing Effect and Electricity Generation in Seasonally Adjusted Solar Photo Voltaic Arrays in Indian Sub-Continent <i>Prakhar Duggal, R.K. Tomar and N.D. Kaushika</i>	9
Evaluating Water Quality of Beni-Haroun Dam (Northeastern Algeria) Before and After Treatment Procedures <i>Sabri Bousbia and Noureddine Bouchareb</i>	19
Enhanced Photocatalytic Degradation of Maxillon Blue Dye (GRL) by Using ZnO NPs in Aqueous Solutions <i>Esraa Ahmed Said, Mohammed Hadi, Hasan Mohammed Abdullah Fadhil A. Rasen and Montather F. Ramadan</i>	27
The Guidelines of Green Building Operation in Thailand Construction Industry <i>Wichit Sopharuk, Pairat Pornpundejwittaya and Thanin Silpcharu</i>	33
Granules as Precursors in the Working of Upflow Anaerobic Sludge Blanket Reactor: A Review on the Impacts of Granulation <i>A. Aishwarya Lakshmi, S. Amalraj and G. Venkatesan</i>	41
People's Perception and the Current Policy Gap for Solid Waste Handling in Delhi <i>Sumant Shekhar, Manoj Chandra Garg, Vinod Kumar Verma and Tanu Jindal</i>	47
Accumulation of Heavy Metals in Associated Irrigated Water, Soil and Production of Tomato around the Export Processing Zone of Bangladesh <i>Prabal Barua, Md. Mazharul Islam and Anisa Mitra</i>	61
Hydrogeochemical Evaluation of Groundwater for Drinking and Irrigation Purposes in Avudaiyarkoil Block, Pudukkottai District, Tamil Nadu, India <i>Kongeswaran, T., Sivakumar, K., Muruganantham, A., Prabakaran, K., Perumal, V. Agastheeswaran, V., Bangaru Priyanga, S. and Muthuramalingam, R.</i>	69
Assessment of Indoor Air Quality in Different Spaces of Residential and Commercial Buildings in Jeddah, Saudi Arabia <i>Maryam Bagaber and Shifana Fatima Kaafil</i>	79
Laboratory Evaluation of Stabilising Components for Effective Treatment of Expansive Soil <i>Kanagarathinam, L., Venkatesan Govindaraj, Gokul, V. Muthukumaran, V. and Yalam Nikhil Sai</i>	87
A Study of the Removal of Pollutants Dyes from Aqueous Solution by Highly Active Low Cost Biosorbents <i>Mohammed Hadi, Hasan Mohammed Abdullah, Ahmad Ismael Saber Dheyaa Yahaia Alhameedi, Shadha Al Qaysi and Ashwaq Talib Kareem</i>	93
<i>Environment News Futures</i>	99