IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 10 Ver. II (Oct. 2016), PP 58-62
www.iosrjournals.org

Detecting Lead in Sera of Iraqi Workers and Evaluation Its Effect on Red Blood Cells

Salman A.ahmed[1]ZainabN. Eyada[1]*
1Department of Chemistry, College of Science, Al-Nahrain University, Baghdad, Iraq

Abstract
Background*: Lead (Pb) is one of the oldest chemical toxins and a harmful environmental pollutant.lead has been used by humans for millennia. It enters human body through food and water consumed, air inhaled and is even absorbed through the skin from cosmetics. The diagnosis of lead poisoning through Measuring blood changes for people exposed to lead and to compare it with control people.*
Aim:*1-Study the effect of lead on red blood cells in working under effect of lead exposure like electric generators , painters and Fuel station .*
2- study level of lead in their blood .
Materials and Methods*: Totally (65) samples of fuel, generatorsand paint workers and (30) control sample were included in this study. Lead element measured in the sera of all subjects by using atomic absorption spectroscopy.Hemoglobin and red blood cell were also measured.*
Results*: The results of the study showed a high-significant elevation in lead in the sera of Iraqi workers who worked on the operation of diesel electricgenerators, fuel and paintingin association to control samples.*
Conclusions: *The results showedthat high sera concentration of lead has a significant correlation withanemia and biochemical markers that may help to detect impairment in the body function in lead exposed workers.*
Keyword: *electric generators workers, lead, RBC and hemoglobin*

I. Introduction

Lead (Pb) is one of the oldest chemical substance which is toxic and a harmful environmental pollutant.(1). lead had been used by humans for millennia and is widespread today in products as diverse as: pipes, storage batteries,pigments, paints, glazes, vinyl products, shot and ammunition, cable covers; and radiation shielding… etc.(2). It isavailable in paint, gasoline, solder, and consumer productsand it may be present in air, food, water, dust, and soil. Although there are several exposure sources, lead-based paint is the most widespread and dangerous due to representing a high-dose source of lead exposure for young children (1,3)exposures to lead occurs through ingestion or inhalation and skin exposure(4,5). Leada source of major concern in occupational health (6). Lead affects multiple bodysystems,compounds are being emitted from car exhaust into the ambient air in urban sites which cause a variety of clinical signs and hematopoietic changes. This issue has always been including the neurologic, hematologic, gastrointestinal, cardiovascular, and renal systems. Acute exposures may cause gastrointestinal disturbances(e.g., hepatic and renal damage), hypertension and neurological effects(e.g., malaise, drowsiness, and encephalopathy) that may lead to convulsions and death, Chronic exposure often causes hematological effects, such as anemia, or neurological disturbances, including headache, irritability, lethargy, convulsions, muscle weakness, ataxia, tremors and paralysis (7) . Lead exposure may lead to anemia, due to reduced hemoglobin production and shortened life-span of erythrocytes (8).
Adsorption is one of the most common approaches to remove those heavy metal ions from drinking water, due to its technological and cost advantages To remove lead chelating agents are used, that form strong bonds to heavy metals. Chelation therapy has been largely used for lead(II) detoxification since the early 1950s (9) Blood tests are typically used to measure the concentration or amount of lead in patient blood, and are used to detect lead in exposed patients (10).

II. Materials And Methods

Blood samples were collected from 65 Iraqi male workers on the operation of diesel generators, painters, workers in gas stations comparing with 30 males with other jobs, The medical history was taken. 5 mls. were taken from each by V.P. The blood was allowed to clot for 10-15 min. at room temperature, centrifuged for (10) min. at (3000rpm). The sera was stored in -20C0 until use . Serum`s lead was determined by atomic absorption spectroscopy. Hemoglobin and red blood cell were measured by Ruby Hematology Analyzer. and Determination of blood filmby using microscope Nikon The Statistical Analysis System- SAS (2012) program was used to study effect of difference factors in study parameters. Least significant difference –LSD test was used to significant compare between means in this study (11).

III. Results

The results were observed from sixty-fiveof workers 30 normal men were serve as non-workers shown in table 1and figure 1. lead level showed a significant increase in worker group when compared to non-workergroup ($p < 0.001$).

Table 1- Compare between workersand non-workers in Pb

Group	No.	Mean ± SE of Pb (µg/dl)
Non-workers	30	2.92 ± 0.28
workers	65	20.31 ± 0.96
T-Test	---	0.369 **
P-value	---	0.0001
		** (P<0.01).

According to lead's level in their blood, the workers group was divided into three subgroups, (Painting, Generator workers and Fuel workers)and as shown in table (2)and figure (2)

Table 2. Compare between difference groups in Pb

Group	No.	Mean ± SE of Pb (µg/dl)
Non-workers	30	2.92 ± 0.28 d
Painter	19	12.95 ± 0.49 c
Generator workers	23	17.13 ± 0.54 b
Gas stations workers	23	29.56 ± 0.89 a
T-Test	---	1.618 **
P-value	---	0.0001
** (P<0.01).		

Result in table (3)and figure(3) showed that there are high significant decreases in the mean of RBC ($x10^{12}$) of patient in comparison with other groups ($p<0.01$)

Table 3. Compare between (Non-workers) and (Non-workers) in RBC(10e12/L)

Group	No.	Mean ± SE of RBC ($x10^{12}$)
Non-workers	30	4.80 ± 0.12
workers	65	4.05 ± 0.11
T-Test	---	2.848 **
P-value	---	0.0001
** (P<0.01).		

Result in table (4) and figure (4) showed there were high-significant decrease ($p<0.01$) in the mean concentration of RBC in tow group in comparison with mean RBC concentration of painter and non-worker group

Table 4. Compare between difference groups in RBC(10e12/L)

Group	No.	Mean ± SE of RBC($x10^{12}$)
Non-workers	30	4.81 ± 0.12 a
Painter	19	4.98 ± 0.15 a
Generator workers	23	4.21 ± 0.10 b
Fuel workers	23	3.11 ± 0.07 c
T-Test	---	0.328 **
P-value	---	0.0001
** (P<0.01).		

Result in table(5)and figure(5) showed that there are high significant decrease in the mean of HGB (g/dl) of worker in comparison with non-worker group($p<0.001$)

Table 5. Compare between (workers) and(Non-workers) in HGB

Group	No.	Mean ± SE of HGB (g/dl)
Non-workers	30	13.49 ± 0.12
workers	65	10.76 ± 0.17
T-Test	---	0.553 **
P-value	---	0.0001
** (P<0.01).		

Result in table (6)and figure(6) showed that there are high significant decreases in the mean of HGB (g/dl) of Fuel workers in comparison with other groups ($p<0.001$)

Table 6. Compare between difference groups in HGB

Group	No.	Mean ± SE of HGB (g/dl)
Non-workers	30	13.49 ± 0.13 a
Painter	19	12.52 ± 0.24 b
Generator workers	23	10.57 ± 0.14 c
Fuel workers	23	9.48 ± 0.10 d
T-Test	---	0.438 **
P-value	---	0.0001
** (P<0.01).		

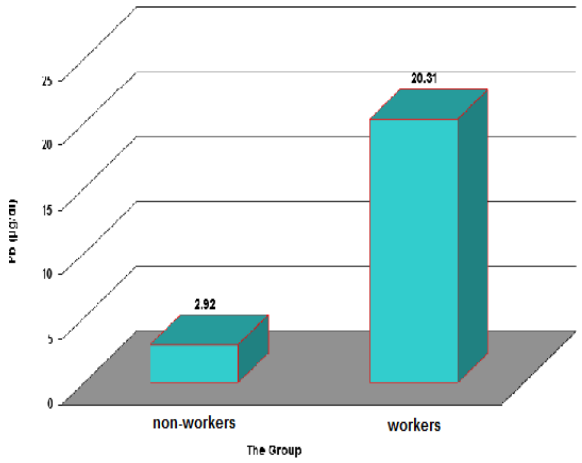


Figure 1. compare between workers and non-workers in pb

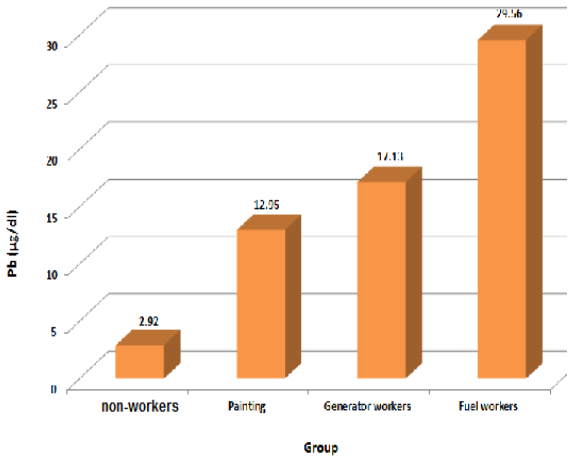


Figure 2 . Compare between difference groups in Pb

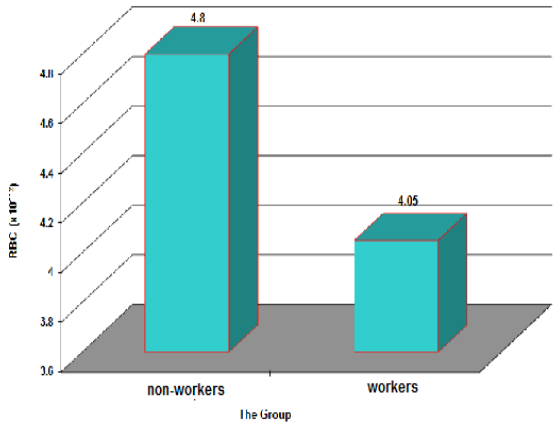


Figure 3. compare between workers and non-workers in RBC

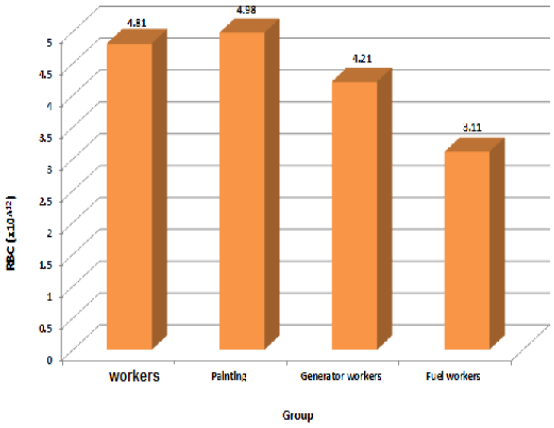


Figure 4 . Compare between difference groups in RBC

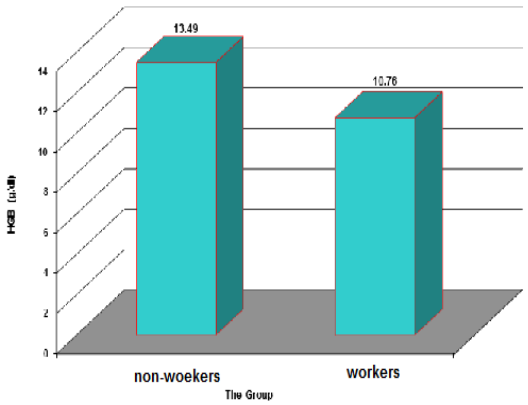
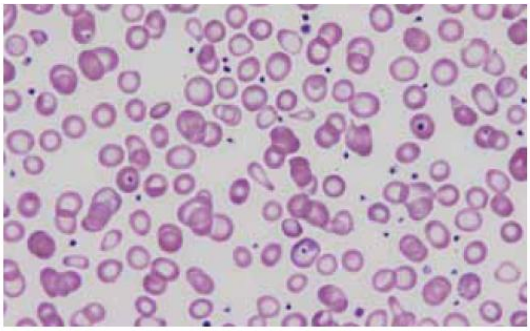
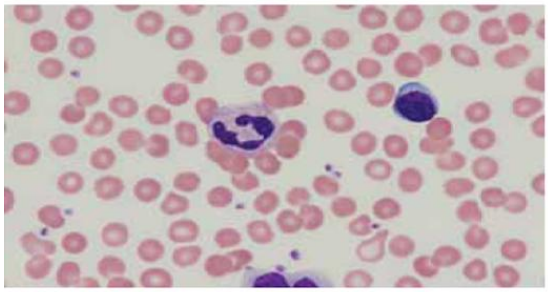


Figure 5. Compare between workers and non-workers in HGB

Figure 6. Compare between difference groups in HGB



Iron deficiency anemia



Normal blood film

Figure 7. compare between worker and non-worker in blood film

IV. Disscution

The tables and figures involved the results of two hematological features which investigated in the blood of Iraqi workers on the operation of diesel generators, Painting and gas station workers in addition to control group .These studied parameters involved in this study will be reviewed and discussed as follows

Lead's concentration was measured in the sera of the workers and non-workers groups by flame atomic absorption spectrophotometer, and the result of the current study is illustrated in table1. Lead levels showed significant increases in workers group when compared to non-workersgroup($p < 0.01$).according to(12)define a blood lead level of 10 µg/dL (0.48 µmol/L) as the threshold of concern in adult and (5µg/dL)in children.

According to lead's level in their blood, the workers group was divided into three subgroups, (Painter ,Generator workers and Fuel workers) and as shown in table (2).theresult in table (2) and figure (2) showed there were high-significant increase ($p<0.01$) in the mean concentration of blood lead in three group in comparison with mean blood lead concentration of non-worksgroup. blood lead concentration of Fuel workers is high when it compares with mean blood lead Generator workers. The reason that there is a very important substance and Toxic it's called tetra ethyl lead (TEL) Which is used as resistance to cracking in gasoline it classified as very toxic that cause severe mental disorders and it'sthe main source for lead contamination at gas stations (13). This result is consistent with other studies(Manal.F.A and etc. 2014)Because of The Gases of generator There are many gases and compounds emitted from diesel generators, which cause air pollution and negatively affect the health of those who work in the gasoline generators.(Mehdi, W. A eta 2014) so we revealed from the table that concentration of blood lead of Generator workers is high-significant when it compares with PaintingThis result is consistent with other studies (Mehde,A.A etc. (2015) andAhmed M. A eta (2012) Painting showed there were high-significant increase ($p<0.01$) in the mean concentration of blood lead the cause may be: 1-non-use of facial masks during work that increases the level of lead in blood due to inhalation of lead present in air. 2-neglect use protective clothing and body wash after work this increase the level of lead in blood due to dermal absorption(13).

This result is consistent with other studies(Ahmed, F.(2014))The red blood cells have happened to her high-significant decrease in male patients' who have Significant increase in the level of lead in the blood and this is consistent with the study of,(Kim CB and etc. 2013) where he had noted a decrease in the total content of the red blood cells as well as the occurrence of the high proportion of deformed red blood cells Which reduces their ability To carry oxygen. Lead also is working on breaking down of red blood cells. (Almurshidi.S.Z&etc. 2014)

الـ ذ تائ ج من ت اكدي

We notes from the figure (7) that significant decrease in the total content of red blood cells, as well as the high proportion of deformed red blood cells, which reduces their ability to carry oxygen

And therefore prevent delivery of oxygen to the various tissues, as well as lead work on breaking down of red blood cells in the workers when compare with non-worker This is consistent with a study (Karai, I and etc. 2010).The concentration of lead in the blood is inversely related to the level of hemoglobin in the blood when increasing the lead. The concentration of iron in the blood is decrease and this leads to a decline in red blood cell. (Almurshidi.S.Z&etc. 2014)

V. Conclusion

The following conclusions were drawn from our study

1. Serum lead levels were below the safety limits of 10 microgram/dl in all patients .
2. Serum lead elevated in fuel workers, generator workers and painters .
3. Hb and RBC is reversely correlated with serum Lead levels .

References

يفضل توحيد الخط في كتابة المصادر ومن دون خطوط زرقاء

[1]. Mohammed, S. M. (2014). Hematological, Biochemical and Blood Lead Level Profile among Gasoline Exposed Station Workers in SulaimaniyaCity,ARO.10036, 6 pages
[2]. work health organization,(2010) childhood lead poisoning http://www.who.int/ceh/publications/leadguidance.pdf
[3]. delaware health and social services , (2015) lead poisoning http://dhss.delaware.gov/dhss/dph/files/leadpoisonfaq.pdf
[4]. Zheng, N., Liu, J., Wang, Q., & Liang, Z. (2010). Health risk assessment of heavy metal exposure to street dust in the zinc smelting district, Northeast of China. Science of the Total Environment, 408(4), 726-733.
[5]. Athab, A.M., Rashid, B.A., Abd, A.Q., Aldelaimy, R.,A. (2012). The Effects of Lead exposure to workers in electric generator and car mending. J DJBC , Vol: 8 No: 4,(2222-8373)
[6]. Bahrami, A. R., Mahjub, H., &Assari, M. J. (2002). A study of the relationship between ambient lead and blood bead among gasoline-station workers. Iranian Journal of Public Health, 31(3-4), 92-95.
[7]. Advisory Committee on Childhood Lead Poisoning Prevention Of the Centers for Disease Control and Preventio(2013), (GUIDELINES FOR POC BLOOD LEAD MEASUREMENTS) http://www.cdc.gov/nceh/lead/ ACCLPP/20131024_ POCguidelines_final.pdF
[8]. health protection agency, (2012), lead Toxicological overview https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/337733/LEAD_Toxicological_overview__v3.pdf
[9]. Sisombath, N. S., Jalilehvand, F., Schell, A. C., & Wu, Q. (2014). Lead (II) binding to the chelating agent D-penicillamine in aqueous solution. Inorganic chemistry, 53(23), 12459-12468
[10]. National Institute of Environmental Health Sciences (2013) ,(Lead and Your Health) https://www.niehs.nih. gov/health/ materials/lead_ and_your_health_508.pdf
[11]. SAS. 2012. Statistical Analysis System, User's Guide. Statistical. Version 9.1th ed. SAS. Inst. Inc. Cary. N.C. USA.
[12]. U.S. National Library of Medicine.(2015) ,Lead levels – blood https://medlineplus.gov/ency/article/003360.htm
[13]. Almurshidi. S.Z ,Ahmed.H.A, (2014) measuring the concentration of some heavy metals in biological samples workers fuel stations in Riyadh , Theses
[14]. Mehdi, W. A., Eyada, Z. N., & Ismail, R. A. (2014). Study the Effect of Gases Rising From Electric Generators on Sera Protein, Iron, Transferrin and other Biochemical Parameters in Iraqi Workers Employed on the Operation of Diesel Generators. Australian Journal of Basic and Applied Sciences, 8, 521-526.
[15]. Mehde,A.A, Faridah,Y , Mezal,S.A,. Farhan,L.Om, &Mehdi,W.A (2015). Study the Effect of increased levels of lead on Sera Alpha Amylase Activity, and Some Biochemical Parameters from a Large Private Electrical Generators Workers. AENSI Journals ,9(8), 163-167
[16]. Ahmed, F.(2014) Association of Lead with Heamoglubin damage in males (car painters) of Lahore. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 1(13), 83-88.
[17]. Kim CB, Shin S , Song SH (2013). Hemorheological changes caused by lead exposure. NCBI Journal, ;55(3):341-8. doi: 10.3233/CH-2012-1641.
[18]. Almurshidi.S.Z,&Ahmed.H.A, (2014). Study of the Effect of Blood Lead Level on Iron Situation and Biochemical Change and Blood Indices In Gas Station Workers In Riyadh. Theses
[19]. Karai, I.; Fukumoto, K. and Horiguchi, O.(2010). Effect of lead on the osmotic fragility of red blood cells in rabbits by the use of coil planet centrifuge (author's transl). Physiol. And Biol. Chem. 33(5):20-25