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BLOOD LEAD LEVEL AMONG A SAMPLE OF IRAQI WORKERS IN BAGHDAD CITY

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ABSTRACT

Background: Lead poisoning and occupational lead exposure remains a serious problem despite awareness of its adverse health effects in the world. The present study aimed to determine the levels of blood lead among a sample of Iraqi workers in Baghdad city. ***Subject and methods:*** A cross sectional study has been designed for a sample of subjects consists of (176) adult men, aged between (20-60) years divided into 4 groups, (44) in each group including traffic policemen, taxi drivers and generators workers, while the controls group which included volunteered healthy adults men. The study has been conducted in Baghdad City from 1st December 2016 to the end of 30th June 2017. Data were collected using questionnaire throughout interview technique for all adult men. Blood lead level was measured by Atomic Absorption Spectrophotometer. ***Results:*** The findings revealed that the higher mean blood lead levels in (generators workers) 28.43 µg/dl and lower in traffic policeman 20.43µg/dl and the lowest in taxi driver 19.45µg/dl. Mean of blood lead levels in controls 12.35µg/dl, also the results revealed that there is a significant difference between Mean blood lead levels and study samples, and the comparison between study sample in (age and duration of work). There was also a different variation in the comparison between study sample in (marital status and residency). ***Conclusions:*** A highly significant difference between Mean blood lead levels in (generators workers) 28.43 µg/dl and lower in traffic policeman 20.43µg/dl and the lowest in taxi driver 19.45µg/dl.

KEYWORDS: Blood Lead Levels, Baghdad City, Iraq.

INTRODUCTION

Lead Poisoning is one of the oldest occupational hazards in the world and it is the one of most significant prevalent occupational and environmental current health issues . Inhalation of lead, poor personal hygiene, and ingestion of lead – contaminated water and food conducted as contributes to the exposure of adults category which is the most widely exposed to lead at places to work.[1] However, several studies have considered, according to a biological point of view, lead as a nonessential trace element and has no any biological function . Lead exposure is correlated with toxic effects such as : neurological, reproductive, gastrointestinal, hematopoietic, and renal system.[2] Through the digestive and / or respiratory tract Pb accesses the body then absorbed by blood . About 99% of Pb in blood is bund with erythrocytes and the residuum distributed in the plasma.[3] The main source for adults exposure of lead occur in places of work, where the lead exposure may include gasoline, paint, smelters, fuel used for heating, battery recycling factories, some glazed ceramics, and some Asian cosmetics.[4] Cars, buses, and trucks consider as source of pollution, when engines burn fuels like gasoline or diesel, large amounts of chemicals produced and emitted in engine exhaust. Additionally, some of gasoline used by engines vaporizes into air without having burned, this produces pollution as well.[5]

Lead is a non – essential trace element for human and has a toxic potential for the biological systems. High level of lead causes adverse effects on many system of body including neurological like mental retardation, learning and behavioral abnormalities and others containing reproductive, gastrointestinal, hematopoietic and renal systems.[6] In recent years, there has been increasing interest in reviews concluded that early life exposure of lead has late – life neurodegenerative effect in old age.[7]

Exposure of lead has been related to multiple health effects and damages to most physiological human system. However, among occupationally exposed individuals, effects of lead can be observed in gastrointestinal symptomatology, anemia, cardiovascular diseases, hearing loss, nervous system (nerve conductive effects, on behavior, and cognition) reproductive system, genotoxicity, and carcinogenicity.[8]

The Occupational Safety and Health Administration (OSHA)lead standards about occupations should remove from lead exposure when repeat screening blood lead levels within 3 months and the result are equal to or more than 30 µg/dl and allow them to return to work only when BLLs lower than 20 µg/dl.[9]

The blood lead level may be increased after occupational exposure especially in developing countries due to absence of personal productive equipment's, poor education, lack of personal hygiene, and under nutrition.[10] In general, as observed from prior studies that a lot of occupations are the high risk categories for the adverse health effect of pollution, compared to general population, and also occupational studies on workers personnel help us to understand the effects of vehicular pollution and its specific adverse effect due to the opportunity for defined exposures measurements.[11] Although, there were many studies and researches in Iraq about surveys few of them focused on environmental pollution from oil industry activities. There have been relatively few recent studies on a small numbers of areas by Iraqi researchers on environmental pollution in Iraqi governorates especially in some industrial areas.[12]

Number of questions have been raised about safety of prolonged usage of lead in petrol in Iraq because of lead exposure estimated to 0.6% of global burden disease, with highest burden in developing region.[13] Recently, increase in use of lead in petrol (gasoline), paint and plumbing have resulted in fundamental rise in lead levels in blood.[14]

Objective of the study: To determine blood lead levels, risk factors for lead poisoning among a sample and to evaluate the effect of exposure to environmental lead on traffic policemen and taxi driver addition to generators on generators workers.

MATERIALS AND METHODS

Study Design: Implementation of the cross sectional design from the first of December, 2016 to 30th of June, 2017 in order to achieve the objective of the present study.

Setting of the study: The data were collected from Baghdad Center (Baghdad City is capital of Iraq). The investigation were carried out in Medical City Directorate, Poisoning Consultation Center for all samples collected.

Subjects of the study The subjects of the study consisted of (176) adult men who are divided into four groups, (44) four each traffic policemen, taxi drivers and generators workers and (44) of apparently healthy subjects.

Data collection and method: The data collection have been conducted during a period of 3 months extending from the first of December, 2016 to the twenty-eighth of February, 2017, Five milliliters of venous blood were collected from each subject by venipuncture by using

dry disposable plastic syringe. The blood sample put in EDTA tubes and then put in ice box transport for measuring the blood lead level. The time sequence of data collection was 4hours per day (9 a.m. to 1 p.m.). Blood test elements at the Poisoning Consultation Center / City of Medicine - Baghdad by atomic flame atomic absorption spectrophotometer (NOVA 300). Hallow cathode lamp used for lead absorption is measured in fuel - rich flame in order to obtain maximum sensitivity. Taking the supernatant by using adjustable micropipettes with disposable tips and put it in a dry, plastic plain tube for lead examination with atomic absorption spectrometry device. Using standardized procedure / stock standard (1000 µg/ml) was used to make working standard, (10,20,30 µg/dl) and a calibration curve was done. Samples, controls and standard were directly aspirated into air – acetylene flame where the lead hallow cathode lamp was used at a wave length of 283.2nm. The toxic or action blood lead level is ≥ 25 µg/dl.[15] In poisoning consultation center - Iraq, toxic or action blood lead level considered in value ≥ 25 µg / dl.

Statistical Analysis: Data were present in simple measures of mean, standard deviation, using independent student t-test for difference between two means (ANOVA) while dennett test to compare between groups. While different percentage (qualitative data) from different groups and from controls group were tested using Chi-square test. Fisher exact test for Yates correlation formula was applied whenever application Statistical significance was considered whenever the P- value was equal or less than 0.05.

RESULTS

Table 1. shows distribution among study sample according to age groups, the highest percentage in generators workers aged between **40-49** years **(31.82%)** and less percentage between **20-29** years **(13.64%)**. traffic policeman highest percentage between **40-49** years **(27.27%)** and less percentage between **30-39** years **(18.18%)**. The taxi drivers highest percentage between **50-59** years **(31.82%)** and less percentage between **20-29** years **(18.18%)**. While in controls group highest percentage between **50-59** years **(36.36%)** and less percentage between **20-29** years **(11.36%)**, and shows highly significant difference among study sample according to age groups (**p= 0.0001**).

Table 1: The distribution age groups among study sample.

Age groups	Generator Workers		Traffic Policemen		Taxi Drivers		Controls		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
20-29	6	13.64	13	29.55	8	18.18	5	11.36	32	18.18
30-39	11	25.00	8	18.18	10	22.73	11	25.00	40	22.73
40-49	14	31.82	12	27.27	12	27.27	12	27.27	50	28.41
50-59	13	29.55	11	25.00	14	31.82	16	36.36	54	30.68
Total	**44**	**100.00**	**44**	**100.00**	**44**	**100.00**	**44**	**100.00**	**176**	**100.00**

χ^2= 6.553 df=9 p= 0.001

Table 2. shows The distribution marital status and residence among study sample, most groups were married **(> 80%),** while the unmarried was **(< 20 %)** and was statistically non-significant **(p= 0.093**). Regarding residency non-significant difference were seen between urban and rural among study sample (**p= 0.411**).

Table 2: The distribution marital status and residence among study sample.

Marital status and Residence		Generator Workers		Traffic Policemen		Taxi Drivers		Controls		Total		P.V
		No.	%	No.	%	No.	%	No.	%	No.	%	
Marital status	Unmarried	8	18.18	4	9.09	7	15.91	13	29.55	32	18.18	0.093
	Married	36	81.82	40	90.91	37	84.09	31	70.45	144	81.82	
	Total	**44**	**100**	**44**	**100**	**44**	**100**	**44**	**100**	**176**	**100**	
Residence	Urban	32	72.73	29	65.91	32	72.73	36	81.82	129	73.30	0.411
	Rural	12	27.27	15	34.09	12	27.27	8	18.18	47	26.70	
	Total	**44**	**100**	**44**	**100**	**44**	**100**	**44**	**100**	**176**	**100**	

Table 3. shows The distribution of duration of work in work place among study sample, highest group percentage **40.34%** for those with **>10** years' work and lower percentage **40.34%** for those with **5-10** years' work then lowest **18.18%** for those with **<5** years work, and high significant difference was seen according to duration of work in work place (**P= 0.021**).

Table 3: The distribution of duration of work in work place among study sample.

Duration of work	Generator Workers		Traffic Policemen		Taxi Drivers		Controls		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
<5 years	3	6.82	11	25.00	8	18.18	10	22.73	32	18.18
5-10 years	17	38.64	17	38.64	17	38.64	20	45.45	71	40.34
>10 years	24	54.55	16	36.36	19	43.18	14	31.82	73	41.48
Total	**44**	**100**	**44**	**100**	**44**	**100**	**44**	**100**	**176**	**100**

χ2=8.240 df=6 p= 0.021*

Regarding blood lead levels significance difference (p= 0.0001) were found between cases (generation workers Mean±SD = **28.43±4.20 µg/dl**, traffic policeman Mean±SD = **20.43± 2.60 µg/dl** and taxi driver Mean±SD = **19.45±2.66 µg/dl**) and controls group (Mean±SD = **12.35±2.12 µg/dl**). (Table 4).

Table 4: The distribution of blood lead levels (µg/dl) among study group.

Study sample	No.	Mean (µg/dl)	Std. deviation	95% Confidence Interval for Mean		Minimum	Maximum	ANOVA test
				Lower Bound	Upper Bound			
Generator Workers	44	28.43	4.20	27.15	29.71	21.00	36.00	F test= 414.801 P.Value=0.0 001*
Traffic Policemen	44	20.43	2.60	19.64	21.22	16.00	26.00	
Taxi Drivers	44	19.45	2.66	18.64	20.26	15.00	26.00	
Controls Group	44	12.35	2.12	11.98	12.71	9.00	17.00	
Total	**176**	**20.18**	**6.54**	**16.76**	**18.35**	**9.00**	**36.00**	

DISCUSSION

Sociodemographic Characteristics: Age: Likewise previous researchers reported that lead was highly significantly accumulated with increasing age.[16] However, in current study, highly significant difference was observed at older age among study groups as it has been found in the age group (40-49 years) and (50 -59 years) with highly statistical significance. That agrees with above study. lead used as a faulty building block in place of calcium, these lead to accumulation and binding of Pb to bone over time.[17] This probably explain this results the age an important factor in increasing the accumulation of lead. **Residence:** Non-significant difference was found between study sample in rural and urban areas because the populations were selected in central areas of Baqubah to assess the average exposure and any specific source of the pollutant. The main sources of Pb exposure for the general population was airborne particulate (smoke included). These findings agreed well with the fact that environmental lead pollution is a major problem in our country, Beside the leaded gasoline, which was considered the major source of environmental inorganic lead exposure, this results agrees with findings of other local studies in Kurdistan region-Iraq[18] and other studies in Pakistan.[19] **Marital Status:** If we consider that single workers would have irregular life compared to married workers, they may be expected to behave more careless in adapting the protective rules which would lead to lead poisoning in them. However, in the current study, the association was found to be statically not significant in study sample according marital status, these results agrees with findings of study in Turkey.[20] **Duration of Work:** In the current study which showed significant difference in duration of work in work

place between each group in study sample especially for those with more than 10 years' work. A similar type of results were obtained in Baghdad - an Iraqi study[21] and Hilla City-Iraqi study[22] on lead, may be due to absence of the protective measures, not taking breaks during work shifts or there is no job rotation among workers. **Regarding Blood Lead Levels:** Among all participants in this study the mean BLLs value were 20.19µg/dL. This value is much lower than the mean BLLs of the non- occupationally exposed individuals reported in Baghdad City / Iraq 24.53 µg/dL[21] and also in various type of male workers in Hilla city/ Iraq 23.50 µg/dL[22], However, one the most important reason for the relatively high level of lead in blood sample of people was that the high concentrations of Pb in the air. In Kirkuk city-Iraq, the level of atmospheric lead was 956.8 µg/m³ in 2011*.[23] This value is much higher than the mean BLLs of the general population reported in Basrah / Iraq 11.20 µg/dL[24], this may be due to low occupational exposure, while in Duhok-province/ Iraq that measured during the year 2011 which was 7.3 µg/dL also was very lower from our study[18], this may be due to the origin of their sample which were taken mainly from rural and suburban regions and the nature of their geographical area as well as the low occupational exposure. Among all participants in this study the mean BLLs value in controls group were 12.349 µg/dL. This value is lower than the mean BLLs of the occupationally non exposed comparison group reported in Hilla City/ Iraq 13.02 µg/dL[22], and higher than the mean BLLs of the controls group reported in Al-Najaf -province / Iraq 10.7 µg/dL.[25]

CONCLUSIONS

The blood lead levels in study sample was 20.19µg/dL, and significant difference between each groups was higher than surrounding our country . Significant difference between group (generator workers, traffic policeman and taxi drivers) and blood lead levels.

Recommendations

The study recommends the following: Health authorities tighten supervision and provide minimum occupational safety measures, and Improving procedures of health risk assessment. Improving identification of populations at high risk of exposure on the basis of monitoring systems and promotion of understanding and awareness of exposure to lead. Increase educational programs of heavy metals and their effects, especially lead. Oblige occupations, especially generators workers, traffic police and taxi drivers, to use protective mask to protect their respiratory system and minimize inhalation of air pollution by lead during work. Environmental monitoring departments continuously monitor and measure the lead ratio in

air and soil, in addition to following up the application of occupational safety rules in most occupations and employees. Conduct a comprehensive study of Iraq to determine the natural value of lead that can be adopted as a real value for health and occupational safety in Iraq.

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