

Levels of Lead as Trace Metal in Blood and Urine Samples from Petrol Stations Workers in Dywania City

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Abstract

A comparative study was carried out in 25 male volunteer workers in different petrol stations, and on 25 control group to compare the difference of lead concentration in the blood and urine specimens taken from both groups , results showed elevated blood lead levels , and urine lead excretion , and to study its relation ship of high level with duration of exposure , and age significant differences were found ($p < 0.05$) , while with smoking and social stastuse , there were not significant ($p > 0.05$) .

الخلاصة

تم دراسة مستويات الرصاص كاحد العناصر النزرة في عينات الدم والبول لدى العاملين في محطات البنزين في مدينة الديوانية وذلك خلال صيف 2003 لخمس وعشرون متطوع، فضلا عن (25) كمجموعة سيطرة، وكانت معدلات القيم المسجلة للرصاص في عينات الدم التي تم دراستها عالية وباهمية معنوية ($P < 0.05$) بالمقارنة مع مجموعة السيطرة. اما عينات البول التي فحصها فقد اظهرت زيادة باهمية معنوية ($P < 0.05$) بالمقارنة مع مجموعة السيطرة. و اشار التحليل الاحصائي الى وجود علاقة ذات اهمية معنوية بين مستويات الرصاص في الدم والعمر، والفترة الزمنية باحتمالية معنوية ($P < 0.05$) بينما لم تظهر متغيرات مثل التدخين، والحالة الاجتماعية أي تأثير مهم ($P > 0.05$) للمتطوعين بالمقارنة مع مجموعة السيطرة.

Introduction

Lead is a heavy metal without any know function in the human body It is absorbed slowly and incompletely from the gastrointestinal tract and can also be absorbed from the respiratory tract after inhalation . The distribution of lead in the body is primarily in two pools in the blood, soft tissues, and in bones.Over a period of time, the lead is redistributed and accumulated in bone, teeth and hair, with a small quantity of inorganic lead becoming deposited in the brain, lead is excreted mainly by the kidneys ⁽¹⁾ Chronic exposure results in hypermineralzation of bone, which is evident radiographically. Severity of blood intoxication is not directly related to lead concentration in blood and soft tissues. The toxic effects of long – term exposure to lead have have been known for a long time. Lead poisoning as recognized as a public health problem because its environmental sources are wide spread. The main source of environment lead is tetraalky –lead found in petrol, this has been significantly reduced in many countries

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with the advent of lead-free petrol⁽²⁾. The effect that it will have on the exposure to lead of general population will be determined by monitoring. The lead added to petrol is only one of many sources of lead and contributes only 20-30% of total blood lead^(3,4). The blood lead concentration is the most reliable indication of exposure, for the management of lead in exposed persons; the most important parameter is the blood lead level⁽⁵⁾. The aim of present study is to assess the difference in lead concentration level in the blood and urine samples and its association with the duration of exposure.

Materials and methods

Twenty-five men volunteer were included in the study, their mean age was (30.8 ± 1) years (range 15 to 48 years) and body mass index (90 kg / m²), working in different petrol stations in Al-Dywanah city, and twenty-five healthy and clinically normal control group with similar gender, mean age and body mass index having other work. The study was done during 2003. Mean year exposure 11.1 years, range (2 to 20 years). Blood lead concentration provides the best index of recent exposure to the element and has been used for the biological monitoring of population exposed to environmental lead in many countries. Lead is excreted mainly by the kidney. All were examined by the same examiner by taking 10 ml. blood and morning urine samples were collected and analyzed by the spectrophotometric method in accordance to di phenyl thiocarbozone (di thizone) reagent^(6,7). Students (t-test) were used for comparison of means, and correlation coefficient for relationship with age, duration of exposure, social status and smoking. Paired difference (t-test) were employed in analysis when means were tested.

Results

Table (I) shows that levels of mean blood and urine lead in both petrol stations workers and control group. The data reflected significant increase ($p < 0.05$) in petrol stations workers than controls (Fig I), (Fig II). The students (t-test) was used to examine the difference between workers and control's mean. Table (II) shows that in workers group had also significant correlation ($P < 0.05$) ($r = 0.3$) ($r = -0.53$) with average age and duration of exposure as compared with control group. While are not relevant for smoking or social status. The data suggest that workers in petrol station are at high risk of getting more detrimental of their health after long exposure to the lead taken from the environment.

Table (1) The mean and standard deviation(SD) of measured Parameters in both the workers of petrol stations and control groups.

Note: statistical analysis carried out by students t- test for paired values .The P – values comparing the two groups.

Parametre	group		
	Control n= 25	Workers n – 25	P- value
Blood lead level micro.gm/100ml	Mean ± SD	Mean ± SD	P < 0.05
	31.2 ± 3.36	62.26±11.25	
Urine lead level micro.gm/100ml	79.20 ± 5.74	109.63-21.11	P < 0.05

Table (2) A correlation coefficient of predictors of blood lead level in workers of petrol stations . S – significant, NS – non Significant.

Dependent parameter	Correlation coefficient	P- Value	State
Age(year)	0.3	< 0.05	S
Years of working	- 0.53	< 0.05	S
Smoking	- 0.08	>0.05	NS
Social state	- 0.05	> 0.05	NS

Discussion

Trace metal concentrations in the blood of industrial workers are currently regarded as the most reliable index of exposure to air born industrial pollutants⁽⁸⁾. Lead is still one of the most of the metallic poisons. In adult, inorganic and organic lead compounds may be encountered in industrial exposures⁽⁴⁾. Lead is non essential toxic metal for biological system and has important role in metabolism of copper and zinc. The toxicity of lead due to its larger affinity to the ligand which contain phosphate and thiol⁽⁹⁾. In environment the important sources of lead from emission of media which contain tetraethyl lead compounds⁽¹⁰⁾. In petrol stations exposure to the transport media dust led to increase in the concentration of trace metal at risk level in the blood as compared with control group, Fig (I). Lead causes several toxic effects, early stages are associated with tubular dysfunction⁽¹¹⁾ this results in glycosuria, aminoaciduria, and hyper phosphaturia⁽¹²⁾. Late stages are associated with tubular atrophy and glomerular fibrosis, which may result in a decreased glomerular filtration rate⁽¹³⁾. These facts accord with our results which show increased excretion of lead in the urine of workers of petrol stations as compared with control group Fig(II). The main factors affecting petrol station workers are high temperature and exposure to cars dust, which contain high level of particulate trace metals as indicated in the present study⁽¹⁴⁾. Environmentalists are concern about trace metals other than any single one of interest, therfor accurate techniques are required for monitoring these metals in human tissues. Other metals which are expected to accumalte in human body may cause clinical disorders, thus, their detection is quite important to avoid any expected abnormalities^(15, 16). In summery, blood lead measurments now provides a reliable guide to lead exposure and quality of results is closely controlled through external quality assessment schemes.

Conclusion

Lead is non essential toxic element since the rate of excretion from the body is clearly slow, and it tend to deposit finly in the brain. The environmental sources of lead are widespread. Consequently it is important to prevent lead spreading, and to detect it is traces before it is effects become serious, So that measurments of blood and urine levels of lead are used in diagnosis of it is poisoning. From this study we recommended using lead free petrol.

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