

THE RELATIONSHIP BETWEEN BLOOD LEAD LEVEL AND URINARY CREATININE AMONG THE WORKERS OF BATTERIES FACTORY⁺

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Abstract

This study was carried out during the period between the first of April 2002 and the end of October 2002. This study included 150 subjects. Hundred from factory of batteries workers on production line (male and female) as a first group. On the other hand fifty subjects from the same factory as a control group were chosen from (management, maintenance and clinic) for comparison. Blood lead level and urine creatinine were measured to all subjects. depending on exposure period. The results showed that all the workers in production line have high concentration of lead in the blood but in three different levels. Also they have two different levels for urine creatinine compared with control group. The study indicated that blood lead level increase in workers who do not follow the periodic examination, medical information and those who have hypertension. In conclusion, all these factors affecting the blood lead level and urine creatinine were discussed.

المستخلص

تم اخذ ١٥٠ عينة دم وادرار لإجراء هذه الدراسة، وكانت على شكل مائة عينة لأشخاص في خط الإنتاج (من النساء والرجال) كمجموعة أولى وخمسون عينة كمجموعة ثانية للمقارنة من مكان آخر خارج خط الإنتاج (الطبية، الإدارة، الصيانة). قيس تركيز الرصاص في الدم والكرياتينين في الإدرار لجميع الأشخاص الذين وضعوا تحت الاختبار. أظهرت النتائج أن تركيز الرصاص والكرياتينين عند عمال المجموعة الأولى أعلى من تركيزهما عند المجموعة الثانية واعتمادا على مدة التعرض للرصاص فإن تركيز الرصاص في الدم عند المجموعة الأولى يتضمن ثلاثة مستويات مختلفة بينما تركيز الكرياتينين يتضمن مستويين فقط عند مقارنتهم مع مجموعة السيطرة. كما أظهرت الدراسة وجود زيادة في تركيز الرصاص والكرياتينين عند الأشخاص الذين يعانون من ارتفاع ضغط الدم والذين لا يجرون فحوصات دورية لقياس تركيز الرصاص والكرياتينين والذين لا يلتزمون بالإرشادات الطبية مثل (غسل اليدين قبل الأكل، استخدام وسائل الوقاية، التدخين) كما توضحت في المناقشة.

Aim of the Study

This study was undertaken to identify the relationship between blood lead level and urinary creatinine in the workers of batteries factory at production line and compare this level with control group who are out of production line.

Introduction

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Lead has been known for its toxicity in most living things if it is at high dose [1]. It is found naturally in earth and present in almost all parts of the environment, such as food, air, water, dust, soil, paints and tissues of living organisms including human. [2]

The metal is being used in various aspects including manufacturing of storage batteries, production of chemicals and paints. [3]

Human exposure to lead is mainly from foods and other environmental sources. However it is expected that exposure to environmental lead is normally excessive and produces toxic effects.

Creatinine is the least variable nitrogenous constituent of the blood in which it exists to extent of 1 to 2 μg /100ml in early nephritis, values of 2 to 4 μg \100ml are noted and in chronic hemorrhages nephritis with uremia, 4 to 35 μg \100ml are noted. The adult of medium weight averages about 1.5 μg more readily excretes creatinine [2,3] .

Urinary creatinine is increased in fever and little affected by other metabolic disorders, it has proved of greatest value in determining the completeness of 24 hour urine collection or the rate of blood flow through the kidney [4]. There is a significant relation between blood pressure and the Zinc protoporphyrin level in blood and there is also a significant positive correlated between creatinine and Zinc protoporphyrin in both sexes, protoporphyrin was used to screen for elevated blood lead [5].

Materials and Methods

Grouping of the subjects: Hundred and fifty subjects were included in this study. The first group 100 subjects (56 male, 44 female) from the workers of the production line.

The second group 50 subjects (32 male, 18 female) as a control group from other lines out of production line.

(All subjects from Batteries Factory in Baghdad).

Questionnaire for workers was used to obtain the necessary information relevant to this investigation. Since Zinc protoporphyrin (ZPP) is sensitive to blood lead poisoning analysis it has been measured by (Atomic Absorption-Spectroscopy) to find out the blood lead level [6].

A venous blood drawing from workers and its examination by this procedure. Normal value for lead in the blood is (10- 20 μg /100 ml) if it is more than this concentration it is considered abnormal [5,7].

Creatinine in urine has been determined by Jaffe methods by (Spectrophotometer) [8]. Normal value for creatinine in urine is (1-2 gm /L) if the values are more than this value it is considered abnormal. Percentage of lead and creatinine were calculated according to years of exposure.

Results

Table (1) reveals the number of Battery workers in production line with age, working years, blood lead level and urinary creatinine concentration.

Table-1

Sex	No	Age in year	concentration of lead according to years exposure		Urinary creatinine concentration	
			1-5 year	5-10 year	1-5 year	5-10 year
Male	56	24-47	2.9-8.2 µg/100ml	10.2-22.8 µg/100ml	0.5-1.1 gm/L	0.8-3.3 gm/L
Female	44	20-38	3.1 – 9.4 µg/100ml	11-21.2 µg/100ml	0.6-1.2 gm/L	0.9-2.8 gm/L

It appears there is no relation between age, sex and blood lead level or creatinine in urine concentration but the concentration increases with the exposure period in both sexes.

The results showed that the lead level in 65.7% of workers is (2.9-9.4) µg/100ml and increases to (10.2-11) µg/100ml in 25.3% of workers and lead level of only 9% of workers was more than the normal level that is between (21.2 – 22.8 µg/100ml), also the concentration of creatinine in urine was 0.5-1.2gm/L in 82% of workers and 2.8-3.3 gm/L in 18% of workers.

Table (2) reveals the number of control Batteries workers with age, working years, blood lead level and urinary creatinine concentration.

Table-2

Sex	No	Age in year	concentration of lead according to years exposure		Urinary creatinine concentration	
			1-5 year	5-10 year	1-5 year	5-10 year
Male	32	20-45	2.2-2.5 µg/100ml	2.2-2.5 µg/100ml	0.5-1.1 gm/L	0.5-1.1 gm/L
Female	18	18-42	2-2.1 µg/100ml	2-2.2 µg/100ml	0.6-1.2 gm/L	0.6-1.2 gm/L

Table (1) and (2) showed that the concentrations of lead and creatinine in workers of production lines is more than that in control workers.

Table (3) reveals the relationship between personal behavior and attitudes of workers in Battery Factory and lead level.

Table-3

Worker	Yes	No
have periodic exam.	3-8 µg/100ml	11-18 µg/100ml
Continual smoke	12-18µg/100ml	8-10µg/100ml
Always wash their hand before eating	5-10µg/100ml	12-20µg/100ml
Always wear mask during the work	2-8µg/100ml	10-22.8µg/100ml
Have family history of hypertension	12-20µg/100ml	5-10µg/100ml
Always changes their clothes before leaving the Job.	5-7µg/100ml	14-18µg/100ml

Discussion and Conclusions

The risk of lead poisoning is when lead is above 20-µg/100ml [7]. The lead and its compounds are absorbed through respiratory, skin and digestion.

The high concentration of lead affects the body systems such as blood, nerves, digestive system and kidney [9]. The heavy metals as lead increase urinary creatinine concentration because this metal is transported into renal tubule cell [10].

The present study shows that there is a relationship between urinary creatinine concentration (which is more readily excreted by kidney than urea or uric acid) and blood lead level in Batteries workers in production line. When we compared both concentrations with other workers used as the control group in other lines, we find that the concentrations of blood lead level and urine creatinine in production line are more than the other lines.

The study has found that there are three levels to blood lead concentration and two levels for urine creatinine. Depending on years exposure and many other reasons (using mask during work, follow the periodic examinations, wash hands before eating, change cloths before leaving the job, not smoking, have no hypertension).

Smoking increases the blood lead level because the smoke contains many heavy materials which increased the concentration of lead then affect the creatinine concentration [11].

There is a positive relationship between hypertension and blood lead level. The effect of lead on hypertension may depend on cumulative lifetime dose, the mechanism by which the cumulative dose of lead may cause hypertension. [12,13]

In agreement with all what the other studies found [14,15], we found that it is very necessary to follow periodic examination. Using masks during the work, washing the hands before eating, change the clothing before leaving the job, stop smoking and trying to decrease blood pressure reduce the blood lead level then urine creatinine.

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