ORIGINAL ARTICLE

Lead Contamination in Drinking Water and its Effects on Serum Uric Acid and Hemoglobin Levels in Local Population - A comparative study

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ABSTRACT

The aims and objectives of this study were to identify the impact of lead concentration on serum uric acid and hemoglobin in individuals how used lead contaminated water. The results expressed significant (<0.005) changes in hemoglobin and serum uric acid levels in the individuals of group B than control group A. The standard mean deviation of Lead serum levels, Hemoglobin levels and Uric acids levels in group A and Group B were(16.12±15, 12.10±10, 4.9±12), (26.11±16, 8.20±30, 7.9±22) respectively.

Key words: Hemoglobin, uric acid, lead, genotoxic

INTRODUCTION

In nature lead is found in the form of bedrock ore. It is a heavy metal. It is very useful metal and mostly used in car batteries, color pigments, ammunition, sheathing of cables, weight belts for diving and in some solders[2]. It is also used to store corrosive liquids. Lead waste of all these industries come into water table and its major source in drinking water is through corrosion of plumbing materials with lead components, such as pipes, solder, faucets, fittings, and older galvanized well liners[4]. Lead contamination changed the chemistry of basic components of the water. Lead is very toxic metal which creates cytotoxic and genotoxic effects in biological system. Air, water and many foods is the oral route of lead inside the body[6].

Lead may be deposited in the brain, joints, kidneys and other vital organs. End metabolic product of dietary and endogenous purine is uric acid. It is biosynthesized in the liver and about 65 to 75% excreted by the kidneys while 25to 35 through intestines[5]. When there will be low excretion of uric acid from the body because of any internal or external impact the condition originated is called hyperuricemia[3]. Different researchers described that regular increase in the uric acid levels of body is correlated with continuous lead exposure[7].

It was confirmed by the findings of different researchers that the synthesis of protein that is globin and haem inhibited by inorganic lead. Studies proved that biosynthesis of red blood cells and abnormal haemoglobinization of the red blood cells is associated with lead poisoning[8]. The morphology of bone marrow indicated that normoblastic hyperplasia and abnormal ringed sideroblasts indicated that the controlled production of hemoglobin within the cell is abnormal. Current data of different studies showed that some most important enzymes which take part in the biosynthesis of globin and heme become inactivated because of lead cytotoxicity[10].

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MATERIAL AND METHODS

Current study was conducted in different regions of Lahore Pakistan. In first phase water samples were collected from different areas and in second phase blood samples were collected from those regions. In this study5ml blood sample of 150 different individuals were collected and divided into two parts. 2ml was kept in a tube containing EDTA for estimation of hemoglobin while 3ml into the other container which was allowed to clot for the estimation of uric acid and lead levels. In Group A, 50 were normal individuals where as in Group B and Group C, 50 individuals in each were those how have uric acid and hemoglobin abnormalities in their body. Lead concentration in water and blood samples were measured through atomic absorption spectrophotometer in Institute of Molecular Biology & Biotechnology, The University of Lahore. Uric acid and hemoglobin levels were measured in pathology lab of Jinnah Hospital Lahore. The data was interoperated through SPSS model.

RESULTS

In this study results was very informative the water which is collected from different areas were divided into two major areas i.e. area A and area B. The values of standard mean deviation of lead concentration in water were (87±19, 95±20) respectively. Whereas the standard mean deviation of Lead serum levels, Hemoglobin levels and Uric acids levels in group A and Group B were(16.12±15, 12.10±10, 4.9±12), (26.11±16, 8.20±30, 7.9±22) distinctively. There was a significant (<0.005) difference between the results of Group A and Group B individuals.

Table 1: Lead concentration in drinking water

Regions	Units	Mean ± SD
Area A	µg/L	87±19
Area B	µg/L	95±20

<0.005

Table 2: group A n=50 individuals (control)

Biomarkers	Units	Mean ± SD	P values
Lead serum levels	µg/dl	16.12±15	0.00
Hemoglobin levels	µg/dl	12.10±10	0.00
Uric acids levels	µg/dl	4.9±12	0.00

<0.005

Table3: Group B n=50 individuals (with lead contamination)

Biomarkers	Units	Mean ± SD	P values
Lead serum levels	µg/dl	26.11±16	0.00
Hemoglobin levels	µg/dl	8.20±30	0.00
Uric acids levels	µg/dl	7.9±22	0.00

<0.005

DISCUSSION

Yang et al (2013) was reported through their research that serum Lead levels in women population were higher in those areas where they work in lead industries. Goncalves et al (2012) described with the findings of their research that lead concentration has close association with the raised levels of serum uric acid. Liu et al (2012)claimed that increased levels of lead in the blood caused develop raised uric acid levels [11]. De Oliveira et al (2012) suggested that concentration of uric acid increased by certain concentration of lead which leads to diabetes in the population [9]. The results of the present study are similar to the findings of above researchers. In this study there is a significant (<0.005) changes in the serum of Group B individuals (26.11±16, 8.20±30, 7.9±22) were noted as compared to the control Group A (16.12±15, 12.10±10, 4.9±12).

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