

# Estimation of lead concentration in individuals around Al-Waziriyah battery factory

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**Abstract-** The lead in non-workers blood was determined due to the lead toxicity. Adjacent to the factory exposed in the accumulator production. Method of direct determination of lead Atomic Absorption Spectrophotometry (AAS) . This provide a sensitive and specific method to determine the lead concentration in blood. The procedure precipitated the proteins with trichloroacetic acid (TCA) then the lead extracted with ammonium pyrrolidine dithiocarbonate (APDC) into isobutylmethylketone. The results of Children showed that (10.5%) of them had exceeded the presence of lead 200 µg/100ml while (70.5%) were between 100 – 190 µg/100ml. Adult results showed that (17.5%) of them had exceeded the presence of lead 400 µg/100ml, while (28%) were between 300 – 390 µg/100ml, otherwise (37%) of adults were recorded 200 – 290 µg/100ml of blood, and the rest (17.5%) are less than 190 µg/100ml.

**Index Terms-** Lead Poisoning, Lead Toxicity, Al-Waziriyah,

## I. INTRODUCTION

This study focusing on lead poisoning in people live around Factory manufacturing liquid

batteries. Lead is a toxic heavy metal, found in nature in a non-pure manner, linked to other materials such as cadmium <sup>(1)</sup>. Lead found in the human body and animals due to direct and indirect exposure. It is widely used in industries. It is used in the manufacture of pesticides, batteries, rubber, dyes, fuel. This poisoning of lead is mainly found among people working in chemical factories, such as liquid battery or oil refineries, where large volumes of lead vapor are found in the air <sup>(2)</sup>.

The risk of the lead element in the fact is a non-processed materials cannot be discharged by human, yet the exploitation of human has had the greatest impact in terms of its impact on public health and through two factors: the **First:** - Transmission with environmental components of air, water, soil and food. And the **Second:** - Through various industrial activities such as using 40% of lead as pure metal, 25% of it in the form of alloys

and 35% in chemical compounds. Lead is also used in medical fields in the form of a lotion called lead sugar <sup>(3)</sup>.

Large amounts of inhaled lead are absorbed through the air by the respiratory system. These particles enter the bronchial ramifications and pulmonary vesicles. Small atoms of lead vapor, usually absorbed by Blood in the lung and deposited in the bone marrow, with only 30-40% of the lead absorbed by the respiratory tract and then absorbed into the blood <sup>(4)</sup>. It's also absorbed through the gastrointestinal tract by a small amount of about 5-15% of the amount of lead taken from food. Its absorption rate is about 10% of the total content in the food. The lead is absorbed from the intestinal cavity into the mucous layer and then into the bloodstream. <sup>(5)</sup>. The increase in the absorbed ratio is up to be 50% when the drinking water containing lead ions, The absorption of lead is affected by the presence of other elements such as calcium, phosphorus, iron, copper and zinc in the food. It is also affected by the age, general health and physical condition of the exposed individual. <sup>(6)</sup>. Absorption increases to 50% in the case of fasting, because the stomach is empty or in the case of iron deficiency and calcium; The respiratory and digestive system is more efficient in delivering lead into the body <sup>(11)</sup>.

Lead compounds such as (tetraethyl lead) are rapidly absorbed into the mucous membranes and the skin when they are properly touched and decomposed into the bloodstream and distributed throughout the body. <sup>(7)</sup>. Inorganic lead compounds are not absorbed by the healthy skin but are absorbed into the body by the digestive, Intervenes through wounds and scratches in the skin, while water-soluble lead compounds absorb lead (lead acetate). 85-90% of the lead compounds that do not dissolve in the water are eliminated by highlighting. The rest (10-15%) is absorbed and transferred to the liver and then partially back to the intestines then the Yellow bile is another means of release. It is also believed that Lead is mistaken by body as calcium due to charge similarity  $2+$  <sup>(21)</sup>.

Other issue is Effectiveness of Enzymes. The different tissues of the body contain enzymes that perform specific functions. The content of these tissues and organs of a specific enzyme varies from one tissue to another. The concentrations of these enzymes are higher than their serum. Therefore, any damage or harm that occurs in these tissues and organs leads to the deposition of the components of the tissue and increase of these enzymes in the serum. <sup>(8)</sup>.The amount of increase shows how important to estimate the level of effectiveness of enzymes in the case of various diseases and poisoning cases, including the case of

lead contamination by measuring the concentration of enzyme In the blood we can identify the damaged organ or tissue <sup>(9)</sup>.

### **Lead reactions, effects and pathogenic conditions**

The risk of lead in its tendency to accumulate and aggregation in the bones, where it expels calcium, causing anemia. It reduces the age of red blood cells, and it can lead to permanent damage in the brain leading to severe convulsions that may lead to death. <sup>(12)</sup>. Occupational exposure is a common method of lead poisoning in adults. The rapid passage of lead to the placenta, it may enter the fetus and then interfere with the normal formation. It may also come out dissolved in breast milk and increase its level leading to low scientific awareness, slow learning, headache, anemia, and in some cases lead to death. <sup>(14)</sup>.

As lead affects women, it also affects men where it leads to infertility. <sup>(15)</sup>. The body get rid of lead sometimes through some vital functions such as urination or through discharge and small amounts of it through sweating, but if the body did not get rid of lead these vital functions, it will lead to the problems mentioned earlier <sup>(16)</sup>.

Lead has no specific function or usefulness to the human body, but its rates were safe and normal in the human body before pollution and industrial revolution in the 1980s and 1990s, where rates were close to zero. <sup>(10)</sup>. The blood lead level as

0.05mg / L as acceptable according to the Centers for Disease Control (CDC) and the World Health Organization (WHO). The researchers showed that the level of lead ranged between 10ppm and 42 ppm <sup>(11)</sup>. Lead concentration is higher than 14mg / dl, it affects the growth of cells. And If the ratio is higher than 39mg / dl, it affects the formation of hemoglobin and the nervous system, causing fatigue, memory loss and other problems. The researcher found that the majority of urban children (45.5%) had a blood lead level of 19mg / dl with average 15.9% , while 34.5% had less than 9mg / dl with rate 6.4)). (50% had less than 9mg / dl) and the remaining 50% had levels below 15-44mg / dl. No one had a lead level higher than 45mg / dl <sup>(21)</sup> .

There is a relationship between the concentration of lead with the concentration of sugar in the blood where the relationship is positive, as the higher the concentration of lead the higher proportion of sugar and this is because: Lead is a heavy and dangerous elements of most organs of the body and its tissues, leads to a defect in the secretion of insulin <sup>(22)</sup>. Some countries have developed a diet for those who are exposed to lead more than others, and developed a mechanism for the use of lead mixed with gasoline to reduce the impact of lead on the body and its vital functions in exposed people. There is also another proposal for high sugar in the

exposed lead in the laboratory, which is due to the high concentration of lead in the blood works to decrease the function of kidney (kidney failure that leads to high blood sugar) and here in turn leads to give the opportunity of kidney damage <sup>(23)</sup>.

Concentration	No of Children	Percentage
0 – 90	8	19 %
100 – 190	30	70,5 %
200 - 290	4	10,5 %

**Can we Prevent lead poisoning in adults and children?**

If a person lives in or near the area containing bullets, he can reduce the risk of exposure to children by washing hands after playing outside, before eating, sleeping. Also wiping the ground with a damp swab, furniture, window sills and other surfaces exposed to dust. Keep children away from playing near the main roads or bridges. Feeding children rich meals with iron, calcium, magnesium, vitamin C and vitamin A. Good nutrition prevents the child from absorbing the lead and opening the tap for at least a minute before drinking. <sup>(24)</sup>.

II. METHODOLOGY

The Estimation were included the houses around Al-Waziriyah Batteries Factory at Baghdad the capital city of Iraq. During the study, 88 blood samples were collected from exposed and non-

pollutant persons from October 2016 to February 2017 from different sites, samples were collected for each house with the permission of homeowner was obtained. Each sample was collected in labeled plastic cup and stored in zip-lock bag. The Concentration of Lead in blood were estimated using Atomic Absorption Spectrometry <sup>(8)</sup>.

III. RESULTS

**Table (1)** Children (1 – 12 y) Results of Lead Concentration in Blood mg/ 100 ml

Children suffer from the symptoms of anemia, especially those who have a high concentration of lead in the blood, where (Bayoumi) said that about 90% of the total absorbed lead builds up in the bones and this naturally affects the production of red blood cells. <sup>(25)</sup>. lead also affects the enzymes necessary in The pathogenesis of hemoglobin, including Aminolevulinic acid dehydrates, is called Prophobilinogen, which stimulates the formation of iron as anemia causes hemoglobinemia. <sup>(26)</sup>.

He pointed out that the symptoms of chronic lead poisoning appear in children with mental sagging, mental retardation and inability to concentrate with weakness in memory. Afifi pointed to the possibility of deafness, loss of speech, kidney failure, and brain damage. <sup>(27)</sup>.

The Researcher (Gomaa) points out that the most affected individuals are children in the growth stage.

Lead replaces calcium and stores lead phosphates, damaging the peripheral and central nervous system. <sup>(9)</sup>. In another study by Goodrum at 2009, children between the ages of 3 and 36 months were more sensitive to lead than adults due to incomplete integration of the blood-brain barrier. Which leads to a long period of non-growth of the nervous system. (28).

**Table 2** Adults (21 – 47 y) Results of Lead Concentration in Blood mg/ 100 ml

Concentration	No of Adults	Percentage
100 – 190	8	17,5 %
200 – 290	17	37 %
300 - 390	13	28 %
400 – 490	8	17,5 %

The loss of appetite, circulation and vomiting, which sometimes ends in coma, can be explained by the fact that lead acts as an inhibitor of enzymes in the brain such as Tetrahydrobioterin synthetase and Acetyl Choline Esterase (50-80 mg / 100 cm<sup>3</sup>) If the lead concentration was equal to 40 mg / 100 cm<sup>3</sup>, the previous symptoms did not appear and were confined to the central nervous system .

Lead is the result of life changes due to its interaction with calcium, sodium and magnesium. The risk of lead reaction with calcium lies in the fact that the latter is involved in the functions of neurotransmitters. The risk of lead in this case is

that it replaces calcium at the ends of the neurotransmitters. al, 1997)

#### IV. CONCLUSIONS

The present study shows that the battery factory effect on public health Adults and Children. Further studies are needed to clarify the role of lead and the causing of health problems for both Children or Adults.

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