

STUDY THE EFFECT OF LEAD ELEMENT ON SOME HEMATOLOGICAL PARAMETERS FOR INDUSTRIAL PEOPLES BY FAAS

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Abstract:

The study aimed to assess the level of lead present in serum samples obtained from workers in various industrial sectors in Karbala governorate, Iraq. Its objective was to investigate the potential association between environmental exposure to lead and hematological parameters, while also evaluating the risk of disease in relation to elevated lead levels observed in the serum of adult patients.

At Karbala University's Medicine College in Iraq, the levels of lead concentration in serum samples were assessed. Both occupational workers and healthy controls were included in the study. The Flam atomic absorption spectroscope method was used for this assessment. A total of 75 serum samples were collected and divided into two groups. The first group consisted of 25 control samples, while the second group included 50 individuals who were exposed to lead in their occupations. The data collected was analyzed using SPSS to examine the participants'

The results show that people who were exposed to materials with lead experienced a slight increase in lead levels. Moreover, their blood tests showed a decrease in red blood cell count, hemoglobin concentration, packed cell volume, and neutrophil count. On the other hand, there was a significant increase in the number of white blood cells.

Finally, there was a slight rise in the percentage of Eosinophil, Basophilem, Lymphocyte, and monocyte, but it was not significant. The level of lead in the workers' serum increased, which is similar to various conditions that can lead to diseases like weakened immunity, diabetes, cancer, and anemia.

Keywords: *Flam Atomic Absorption Spectroscope, Heavy element, Industry areas.*

Introduction

The general public are exposed to varying levels of heavy metals like lead in naturally occurring in food, water, and ambient air [1], [2]. Lead is a highly hazardous form of pollution that harms the environment and is a major concern in today's society [3], [4]. Naturally, lead exists in varying concentrations in the air. However, there have been recent issues with lead levels exceeding the acceptable limit in the air. This increase in lead concentrations is primarily due to the release of agricultural, industrial, household, and other types of waste [5].

Over-utilization of heavy elements have negative effects on the environment, and it influences the health of general humans because it is a persistent environmental pollutant due to its widespread use in industry; individuals who work in these industries are more likely to be exposed to them [6], [7].

Unknown biological functions of heavy elements have an impact on health by acting as catalysts for oxidative stress processes, which replace necessary metals [8]. Since lead cannot be broken down or destroyed, bioaccumulation of the metal can have long-term negative effects on health even at lower exposure levels. High levels of exposure to heavy metals are linked to health issues such as cancer, kidney failure, and cardiovascular disease [9], [10].

The brain is considered one of the most vulnerable organs to lead poisoning in humans. Common symptoms associated with this condition encompass headaches, abdominal pain, irritability, constipation, memory issues, tingling sensations, and infertility in the hands and feet [11]. Lead exposure is responsible for nearly 10% of intellectual disabilities without any identifiable cause and can lead to the development of behavioral problems [12].

One of the most common causes of documented lead poisoning is occupational exposure [9]. Lead exposure is a concern for numerous occupational workers, including plumbers, smelters and fitters, auto mechanics, recyclers, and battery producers [13]. Individual differences in anomalous behavior are among the many indicators of lead poisoning, and exposure duration is a significant factor [14]. According to certain research, even when the body's lead levels rise, lead poisoning does not always manifest as symptoms [15].

Materials and Methods

1. Study area

The research was conducted in the Karbala Governorate, which is adjacent to the governorates of Baghdad, Babylon, Anbar, and Najaf. Karbala Governorate includes many local industry areas. The group of samples was taken from the workers group at different industry areas.

2. Blood sample collection

The total blood samples for each of the control group and men working at the industrial area reached 75 samples. Blood samples were collected through venipuncture, and these two groups were placed in a jet tube; and they were distinguished by the numbers assigned to the study participants to calculate lead concentrations.

3. Questionnaire

Initial approvals for the study protocol were obtained by volunteers who participated in the study.

The questionnaire included data on medical history through an interview, taking into account exposure to sources of toxic elements such as smoking habit.

4. Methodology

Three ml of blood was drawn from all the experimental persons directly from the vein at the start of the experiment. Tubes containing anticoagulant were used for blood parameters.

The study was carried out at the College of Medicine, University of Karbala, between the dates of March 14, 2023, and April 1, 2023. During this period, blood samples were collected from a total of 75 individuals who were divided into two groups. The control group consisted of 25 samples, while the experimental group included 50 samples.

5. Lead Measurement

Different techniques are employed to identify blood lead levels that are elevated. Lead poisoning can be identified by looking for tiny blood cell alterations or the lack of thick lines in the child's X-rayed bones [16]. Nonetheless, testing blood samples for lead concentrations is the most crucial method for identifying high lead levels in the body [17], [18]. But this test can only tell you how much lead is in your bloodstream; it can't tell you how much lead is accumulated in your body [9], [19].

The Flam Atomic Absorption Spectroscope was employed to ascertain the levels of lead concentrations in the blood samples of the participants. Laboratory tests were conducted by collecting blood in gel tubes without anticoagulant and subsequently subjecting them to centrifugation at 3000 cycles for a duration of 20 minutes to separate the serum. 20 ml of the sample was injected directly into the electric oven, and the absorbance was measured, and it was converted into concentrations. As well as the device automatically drew the parameters curve and then extracted the slope equation

6. Complete blood count

A blood sample was taken and placed in the urit-2900 device, and the measurement was done automatically.

7. Statistical analysis

The statistical analysis of the data of the experiment was measured by using the SPSS[20], One-way ANOVA was used for Experiment 2, and least significant difference was performed to assess significant differences between group means [21]. Results were expressed as mean $\pm$ standard error and $P < 0.05$ was considered statistically significant [22].

8. Results and discussion

Table (1) displays the average value concentrations of lead in the serum samples for the worker group and the control group. The different between lead concentration in worker group and control group is non-significant differences.

Table (1): Statistical description of lead concentrations (ppb) in serum samples of the study groups.

Statistical Value	Groups	No. of Samples	Mean $\pm$ Std. Error	P-Values
Lead Concentrations (ppb)	Control	25	36 $\pm$ 5.534	0.721
	Worker	50	45 $\pm$ 4.936	

Figure (1) shows the average value of lead concentration in serum samples, worker group is larger control group is due to exposure people to lead accumulation presence of lead in constitutes of material used in their jobs, [24]. The increase level of lead in the worker's serum was similar to many conditions that causes diseases, such as poor immunity, diabetes, cancer and anemia[25]. In an previous study serum lead levels were associated with an increased risk of diabetes [26].

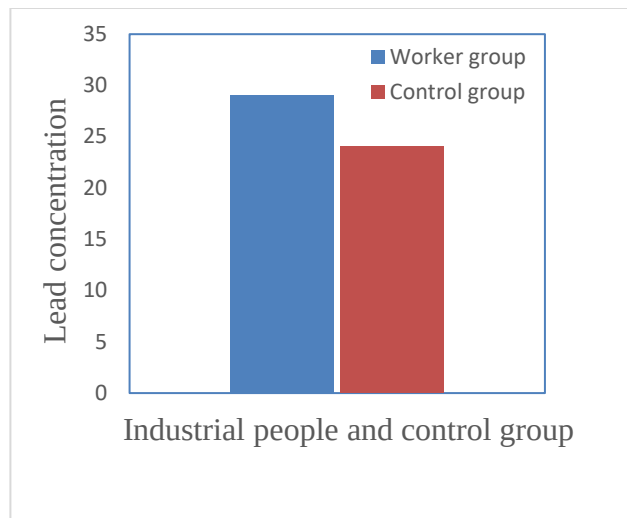


Fig. (1): The mean value of lead concentration for worker and control groups.

Table (2) displays the mean concentrations of red blood cell count, Hemoglobin, and Packed cell volume in the blood samples for both the worker group and the control group. The disparity in red blood cell count between the worker group and control group is 0.3, 0.7, and 1.2, respectively. Consequently, this indicates a negligible decrease in red blood cell count between the worker group and control group.

Table (2): Statistical description of effect of lead on red blood cell, Hemoglobin and Packed cell volume parametrizes.

Statistical Value	Groups	No. of Samples	Mean± Std. Error	P-Values
Red blood cells	Control	25	5.509±0.155	0.03
	Worker	50	5.070±0.103	
Hemoglobin	Control	25	15.215±0.273	0.07
	Worker	50	13.889±0.206	
Packed cell volume	Control	25	43.4 ± 2.420	1.2
	Worker	50	40.5±1.450	

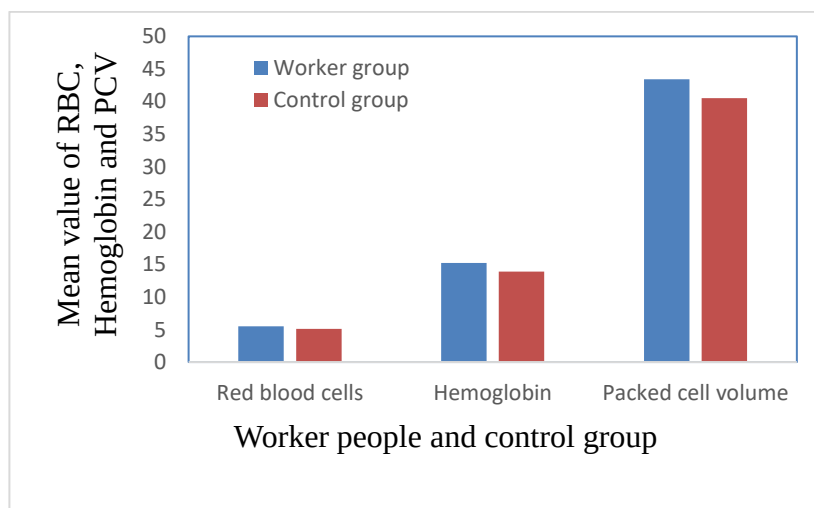


Fig. (2): The mean value of red blood cells counts, Hemoglobin and Packed cell volume for worker and control group.

Lead poisoning reduces the amount of red blood cells and raises the risk of anemia by interfering with enzymatic stages in the heme production pathway, which decreases the ability to generate hemoglobin [27]. Long-term exposure to lead can lead to iron deficiency and anemia. This is because the consumption of lead can decrease the viability of red blood cells and inhibit heme production, which are both factors contributing to anemia [25].

Table (3) show the average value concentrations of white blood cells count, Eosinophil, Basophilem, Lymphocyte, and Neutrophil percentage in the blood samples for the worker group and the control group. There is non-significant different between worker group and control group.

Table (3): Statistical description of effect of white blood cell, Eosinophil, Basophilem, Lymphocyte, monocyte and Neutrophil percentage in blood samples of the study groups.

Statistical Value	Groups	No. of Samples	Mean± Std. Error	P-Values
White blood cell	Control	25	6.099 ± 0.279	0.031
	Worker	50	8.486 ± 0.466	
Eosinophil	Control	25	1.950± 0.228	0.189
	Worker	50	2.915± 0.281	
Basophilem	Control	25	0.200± 0.023	0.772
	Worker	50	0.295± 0.022	
Lymphocyte	Control	25	23.212± 2.268	0.489
	Worker	50	33.677± 2.390	
monocyte	Control	25	6.303± 0.259	0.154
	Worker	50	9.468± 0.592	
Neutrophil	Control	25	65.837± 2.267	0.789
	Worker	50	65.335± 3.072	

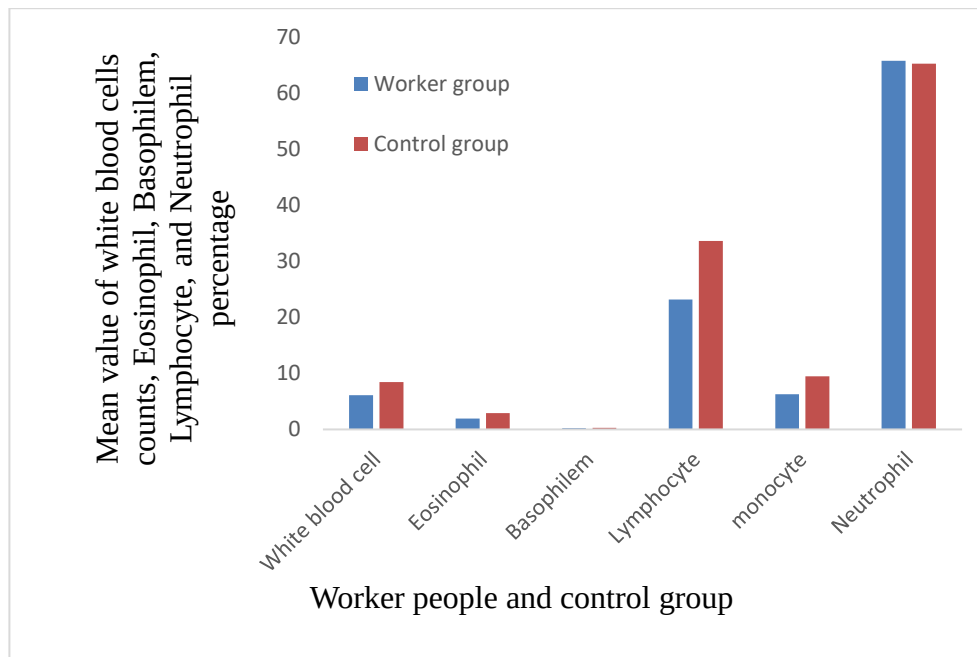


Fig. (3): The mean value of white blood cells counts, Eosinophil, Basophilem, Lymphocyte, and Neutrophil percentage for worker and control group.

The results in the figure above indicate a disruption of the immune response [28]. Many authors hypothesize that lead modulates immune system function. Lead poisoning can cause both immunosuppression and an increased immune response [29]. Lead can affect the function of

receptors and molecules involved in cell signaling by interacting with tyrosine kinases and G proteins. As a result, serious cell damage can occur, including: B. Cell differentiation and proliferation are impaired [30].

9. Conclusion

1. The research findings indicate that individuals employed in industrial areas are exposed to elevated levels of lead, which poses a significant risk to their health. Generally, most industrial areas exhibit pollution levels that surpass the threshold for public health concerns, as some workers have been found to have higher lead levels compared to the control group.
2. The results of our investigation demonstrated that the hematological characteristics of individuals who were exposed to lead were indeed impacted. More specifically, we observed a slight rise in the Eosinophil, Basophile, and Lymphocyte Percentage among the worker population in comparison to the control group, although this increase was not statistically significant. Furthermore, the findings regarding hematological parameters indicated a decrease in the number of red blood cells, concentration of hemoglobin, volume of packed cells, and Neutrophil. In contrast, there was a noteworthy increase observed in the count of white blood cells.

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