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## (( Estimating the level of lead , cadmium and Study of some hematological changes in car repair shop workers in the Al\_diwaniyah city ))

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### **Abstract**

The current study included measuring the levels of lead (Pb) and cadmium (Cd) and Some blood parameters were also studied in the blood samples of car repair shop workers in Diwaniyah,

The results showed that there was a significant increase ( $<0.0001$  P) in the level of lead and cadmium in the blood, which was significantly higher in exposed individuals, reaching  $76.16 \pm 6.37a$  and  $9.73 \pm 1.7a$ , respectively, compared to non- exposed individuals, where it reached  $(0.148 \pm 0.01b)$  and  $(0.233 \pm 0.007b)$  respectively

The results of the current study also indicated that there was a significant increase at the probability level ( $<0.0001$  P) in the number of red blood cells, white blood cells, average hemoglobin concentration, and number of platelets compared with the control group .

## **Introduction**

Toxic substances like gasoline fumes, carbon dioxide fumes, and lead fumes are said to impact workers at auto workshops. The car manufacturing business also uses lead and cadmium as components of spare parts, which may have an impact on the amounts of these metals in the blood serum of employees who handle them (Nsonwu et al., 2021). During smelting processes, automotive workers may inhale these fumes or they may absorb or consume them through their skin (Vergara-Murillo et al., 2022).

More than 95% of lead is subsequently attached to red blood cells and deposited in the bones following absorption; lead is also retained in the kidneys and liver (Dumková et al., 2017). High lead exposure can have detrimental effects on the nervous system, liver, and kidneys. It can also lead to anemia, high blood pressure, cardiovascular disease, immunodeficiency, infertility, and developmental issues like memory loss, learning disabilities, and cognitive deficits (Nigra et al., 2016). Despite the fact that chronic cadmium exposure can lead to a variety of health issues, including immunological, neurological, respiratory, and endocrine system malfunctions. Additionally, it may result in pulmonary edema, injury to the adrenal glands, osteomalacia, and lung cancer in workers (Sears et al., 2012). The respiratory system absorbs cadmium the most, followed by the digestive system to a lesser level, while the skin absorbs it less frequently. Cadmium enters the body through the bloodstream, where it is taken up by albumin and erythrocytes. It then

builds up in the kidneys, liver, and intestines before being eliminated by the body through saliva and urine (Tinkov et al., 2018).

**Keywords:** lead , car repair shop workers, Cadmium, hematological.

## **Materials and Methods**

### **Study design**

Samples were collected from workers in car repair shops and from workers in car spare parts repair. After taking a venous blood sample. 75 samples were taken from different ages from 22 to 65 years It was divided into three group: The first group is from (22-36), the second group is from (37-51), and the third group is from (52-65).

### **Measurement of trace elements lead and cadmium in blood serum.**

- 1- The samples are placed in the Autosampler of the Automatic device
- 2- The item to be checked is selected through the device's software
- 3- A calibration curve for the element is created by injecting standard solutions that are prepared in advance
- 4- After the calibration curve is drawn, the samples are examined by withdrawing 20 microliters of the sample and injecting it into the graphite furnace ( Shimadzu Corporation, 2020).

### **Measurement Blood parameters**

Use a Beckman CBC device with advanced specifications that gives high accuracy in measuring blood parameters and based on the method described by( Beckman Coulter, 2020). It measures blood parameters (red blood cells, white blood cells, hemoglobin, and platelets) in blood samples placed in the EDTA-Tube. The device consists of three main

parts and relies on two types of solutions, where the number of white blood cells is calculated using the cell part. White blood cells, while the number of red blood cells, hemoglobin, and platelets are calculated in the section related to these standards.

### **Statistical Analysis**

Statistical analysis Data were collected, tabulated, and statistically analyzed using a personal computer with “Statistical Package for the Social Sciences (SPSS) version 31 program (IBM corporation, Armonk, NY, USA). Chi-square test was used for evaluation of qualitative data, whereas the one-way ANOVA and T tests were used for evaluation of quantitative data. Value of  $P < 0.05$  was considered statistically significant (Rahman,2015).

### **Ethical consideration**

The study was carried out following ethical clearance from Al-Qadisiyah University's Ethics and Research Committee. Following a previously established protocol, study participants were given a clear explanation of the study's goal, and each participant gave their verbal agreement. Each person's blood sample was taken with a different needle and sterile gloves. All used gloves and needles were brought to the Al Diwaniyah Hospital's waste disposal facility in disposable bags with the proper labels.

### **Results and discussion**

Heavy metal toxicity remains a major concern in many developing countries, and lead and cadmium are among the most important occupational pollutants in today's environment. Moreover, the lack of applicable legislation, public awareness and education makes the individual easily vulnerable to exposure to metals and their hazards. (Ritz *et al.*, 2004).

In this study, (75) individuals between the ages of (22-65 years) who work in car repair shops in Al-Diwaniyah Governorate were selected. A group of (75) individuals who had no history of occupational exposure to heavy metals were also recruited and who served as control subjects. In the same age groups above.

The levels of lead and cadmium in the blood of exposed individuals were estimated and their levels were  $(76.16 \pm 6.37a)$  and  $(9.73 \pm 1.7a)$ , respectively. They were significantly higher in exposed individuals compared to non-exposed individuals and reached  $(0.148 \pm 0.01b)$  and  $(0.233 \pm 0.007b)$  respectively at the probability level ( $P < 0.0001$ ) as shown in Table (2) .

These results are consistent with the results of a study (Nduk *et al.*, 2019) aimed at assessing the health, carcinogenic and non-carcinogenic risks of exposure to heavy metals from reformulated imported compounds .

It also agrees with (Saleh, 2022), as this study showed the effect of some mineral elements on the physiological aspects of workers in the industrial district .

The results of this study are also consistent with another study conducted in Nigeria, which aimed to determine blood lead levels among automobile technicians in Lagos State, Nigeria (Saliu *et al.*, 2015).

Auto mechanics may be exposed to lead and cadmium to a large extent due to unhealthy habits during work, such as sucking gasoline into the mouth and using gasoline to wash hands while working without washing them with soap and water before eating. Therefore, the accumulation of lead and cadmium in the work environment may be the main and real source of exposure to the substances. Toxic through inhalation and skin contact.

According to the World Health Organization, the acceptable level of cadmium in the blood is (0.03-0.12mg/kg) (WHO, 2007). When compared with the permissible range of cadmium in the blood according to the World Health Organization, the average levels of cadmium in the blood in our study were Much higher. Significantly high levels of cadmium may lead to harmful effects associated with cadmium toxicity in workers, as cadmium is absorbed mainly through ingestion and inhalation. Acute exposure leads to disorders in the digestive system, and long-term exposure may lead to respiratory diseases such as pneumonia, renal effects, and increased Excretion of low molecular weight proteins in urine, which affects glomerular function and effects on bones (Satarug *et al.*, 2010).

Inhalation and ingestion represent the two main exposure routes, especially for people exposed occupationally. After absorption, lead is distributed and accumulates in the blood, bones, and soft tissues,

especially the liver and kidneys. Therefore, these organs are particularly sensitive to lead toxicity (Alya *et al.*, 2015).

Human exposure to lead can lead to different biological effects depending on the level and duration of exposure, such as toxic effects on the blood, cardiovascular, nervous, and reproductive systems (Tang *et al.*, 2005)..

High levels of exposure are associated with inflammation of the immune system, and several studies have shown that low levels of exposure to lead and cadmium can lead to damage to the liver, lung, kidney, and other organs in addition to causing systemic inflammatory changes (Werder *et al.*, 2020).

**Table (1) The levels of Lead and Cadmium in workers and Healthy control**

Parameter	Groups		P value
	Workers	Healthy control	
Lead	76.16±6.37a	0.148±0.01b	<0.0001
Cadiumum	9.73±1.7a	0.233±0.007 b	<0.0001

**Values represent mean± SEM, different letters between two means refers to the significant difference (P<0.05)**

The absorption and accumulation of metals in tissues and organs depends on many factors, such as the properties of the metals, their shapes, their route, the dose, the duration of exposure to them, and the

ability to bind to ligands in the cells. The hematopoietic system is one of the most sensitive organs for assessing the toxicity of lead and cadmium (Rahimpoor *et al.*, 2020).

The results of the current study, as shown in Table (5), showed a significant increase at the probability level ( $P < 0.0001$ ) in the number of red blood cells, white blood cells, average hemoglobin concentration, and number of platelets compared with the control group.

The results showed an increase in red blood cells that were at the level ( $5.65 \pm 0.06a$ ) compared with the control group ( $4.50 \pm 0.06b$ ). The study also showed an increase in white blood cells that were at the level ( $9.47 \pm 0.32a$ ) compared with the control group. ( $5.44 \pm 0.09b$ ). The results of the study also indicated an increase in the average hemoglobin concentration ( $16.15 \pm 0.19a$ ) compared to the control group ( $12.74 \pm 0.09b$ ). Also, blood platelets increased and were at the level of ( $356.1 \pm 8.58a$ ) compared to the control group. ( $216.4 \pm 4.82b$ ).

The results of the current study are consistent with (Saadat and Bahaoddini., 2004) and (Firouz Kouhi *et al.*, 2016), which showed the effect of heavy metals on blood, kidney, and liver indicators among workers at car gas stations.

The results of the current study did not agree with (Teklu *et al.*, 2022), as this study showed a significant decrease in blood parameters among workers at fuel filling stations.

The results of the current study may differ from the results of other studies due to the variation in sample size, study period, and duration of exposure .



A possible reason for increased RBC parameters in auto repair shop workers may be due to the fact that these environments are known to contain high concentrations of carbon monoxide that can enter the blood via the respiratory tract. The molecule had a high affinity for Hb up to 200 times that of oxygen to form carboxyhemoglobin which interferes with the oxygen transport capacity of the blood and leads to tissue hypoxia. Tissue hypoxia stimulates erythropoiesis, which ultimately leads to the production of a greater number of red blood cells, and thus higher Hb levels (Shen *et al.*, 2006).

As for the increase in white blood cells, it is known that the basic function of white blood cells is a defensive function in the body, so the increase in the number of these cells indicates the presence of inflammation and diseases in the body (Kamal and Malik, 2012)) The large increase in the total number of blood cells may be White blood cells among car workers in the current study are due to increased exposure to dust or fumes of toxic chemicals, or the increase in the number of white blood cells may be due to some inflammatory and infectious conditions, as the increase in the number of white blood cells is evidence of the activation of the immune system in the body as a result of the presence of lead and cadmium. In various body tissues.

In the current study, the level of platelet value increased compared to the control group, and this is consistent with (Ataro *et al.*, 2018). However, this result contradicts previous studies that showed a negative association between this exposure and platelets (Khuder *et al.*, 2019).

**Table (2) :The levels of Some puppet indicators in Workers and Healthy control.**

Parameter	Groups		P value
	Workers	Healthy control	
WBC	9.47±0.32a	5.44±0.09b	<0.0001
RBC	5.65±0.06a	4.50±0.06b	<0.0001
HGB	16.15±0.19a	12.74±0.09b	<0.0001
PLT	356.1±8.58a	216.4±4.82b	<0.0001

Values represent mean± SEM, different letters between two means refers to the significant difference (P<0.05).

## **Conclusions**

The results of the study revealed that occupational exposure to lead and cadmium has an effect on some blood parameters among exposed people .

Represented by an increase in the number of red blood cells, the number of white blood cells, the concentration of hemoglobin and the number of platelets.

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