

## Evaluation of Chromium Metal in Worker Blood in Dental Laboratories and its impact on Physiological Properties

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**Abstract:** Indoor environmental pollution significantly impacts individual comfort and health. This environment encompasses air quality, temperature humidity lighting, ventilation and the presence of chemical. The health of workers, especially in workshops like dental laboratories, is influenced by factors such as exposure to chemical like chromium, which may volatilize in to the air or build in the bloodstream. This exposure can adversely affect liver and renal function and modify blood parameters. The present study aimed to assess chromium concentrations in the occupational settings of dentistry laboratories in Najaf governorate. We conducted the study on a sample group of sixty male and females, aged under 40 and over 40 year. The samples were categorized into two groups: the first group consisted of 40 samples from dental laboratories, while the second group included 20 samples designated as the control group. The samples were obtained from laboratory workers with working hours varying from under 6 to over 6 hours and with employment durations spanning from less than 5 to more than 10 years. These workers face an elevated risk of exposure to chromium and its related health issues. This investigation turned into carried out by way of quantifying the chromium tiers in the blood of workers and comparing it to the control sample. Certain liver enzymes (ALT and AST) and renal features (creatinine and urea) had been assessed to evaluate the effects of environmental contamination on vital organs. The outcomes indicated heightened chromium ranges inside the people' blood relative to the manage pattern, signifying exposure to abnormal concentrations of this detail. A correlation changed into identified between improved chromium ranges and negative effects on liver and kidney function, with severa people showing alterations in liver and kidney feature parameters, consisting of raised liver enzymes and markers of renal failure. It changed into determined that environmental pollution with dangerous compounds, consisting of chromium, in dentistry laboratories probably adversely influences people' health, necessitating steps to mitigate contamination and beautify health prevention programs in those settings.

**Key points:** Chromium, CBC, ALT, AST, Dental, Lab.

### 1. Introduction:

Throughout the 1930s, they were applied to create frameworks for detachable partial dentures (RPDs). Al Jabbari, in 2014, describes these as being paramount to the development of reusable partial dentures. Additionally, the cloth is frequently applied in different medical fields, which include stents (Iglesias et al., 2017; Gherbesi and Danzi, 2020), intervertebral disc substitute, and knee or hip replacement (Louwerens et al., 2020; Liu et al., 2020). The recognition of Co-Cralloys is normally attributed to their superior mechanical houses, along with stiffness, strength, and resistance to corrosion (Al Jabbari, 2014). Additionally, this type of material is proof against corrosion thru the introduction of Cr-based oxides on its floor; as a result, its biocompatibility increases over time (Buser et al., 2017).The alloy is comprised of 10 different metals, the pair of cobalt and chrome represents 79.9% of the alloy, while the other 9 metals represent 20.1%. Co, Cr and their numerous associations (e.g. cobalt(II) porphyrin, chromeate, chromeium picolinate, and

chromite) are naturally present in soil, water, plants, animals and humans. Cr(0) is, however, a shiny, fragile and hard metal that is encountered in its original state (e.g. natural C from Sichuan). Other forms of Cr include trivalent Cr and hexavalent Cr, these are the most common states (Scharf et al., 2015; Anderson et al., 1997). The form of Cr in food is Cr(III) (CAS No. 16065-83-1, listed in EC/No.605-220-6). Maintaining a typical blood sugar level and ensuring metabolic efficiency is vital to the human body. In humans, a deficiency will lead to a lack of glucose tolerance, fasting hyperglycemia, glycosuria, hypoglycemia, increased insulin levels and a decreased number of insulin receptors (Anderson et al., 1997). As a result, it is obvious that small quantities of chromium are necessary for the proper operation of the human body and all other systems. Unlike Cr(III), Cr(VI) (CAS No. 18540-29-9, EC/No. The 06-053-1) is a toxic, potent oxidizer that is capable of traversing cell membranes. Cr(VI) compounds are considered to be human carcinogens by the IARC (McGregor et al., 2000). However, research has demonstrated that the release of Cr(VI) from alloys is extremely limited, as it is quickly converted to its trivalent state in vivo (Meek et al., 2008). Dental biomaterials must have various properties in order to be suitable for clinical use. The most significant properties include mechanical properties, biocompatibility, non-toxicity, high corrosion resistance, and high wear resistance (Hussein et al., 2015). This portion of the discussion concerns the final two criteria.

Co and Cr dental alloys are distinguished by their resistance to corrosion and oxidation in vivo when used as the starting point for finished products, such as orthodontic wire alloys. However, it's obvious that all materials in the human body, especially those in the oral cavity, are susceptible to corrosion (Chitra et al., 2019; Mikulewicz et al., 2011; De Aguiar et al., 2015). Corrosion is caused by the oxidation of metal components. This phenomenon is complex and multiple types of corrosion may occur, including fretting, pitting and chemical corrosion.

Under typical operating conditions, without the presence of specific corrosion symptoms, the presence of Cr will lead to the formation of a Cr-based oxide layer on the surface (Gibon et al., 2017). The liberation of nickel from nickel-based alloys and other materials has become a concern for manufacturers and consumers. Similarly, the release of metals from CoCr alloys is crucial to understand and subsequently prove whether or not their low toxicity to humans is associated with their low wear.

Many investigations were carried out on CoCr alloys concerning hip, knee, and ankles, the exposure stages can be excessive (Posada et al., 2014; Madl et al., 2015; Kovoichich et al., 2018). Wear is still being studied in notable detail [30], with the purpose of enhancing present alloys and enhancing them via together with additional metals (Heintze et al., 2019). In the dental area, a recent have a look at mentioned the widespread results of using restorative materials (Heintze et al., 2019). All of the research on the volume of damage related to biomedical devices are worried with the potential toxicity of the released debris (Posada et al., 2014; Heintze et al., 2019). The goal of this research become to determine the concentration of chromium inside the blood of dental laboratory employees and examine the effect of this content at the assessment of physiological houses.

## **2. Materials and Methods:**

### **2.1 Sample Study**

Sixty samples of women and men were amassed from dental laboratories in Najaf Al-Ashraf between November 2024 and April 2025. The samples have been partitioned into organizations. The first institution comprised 40 samples, whereas the second one group blanketed 20 samples for the manipulate institution. The located populace changed into monitored on the Martyr Nasser Center and the Kufa Specialized Center. Samples have been amassed from laboratory people with operational hours various from beneath 6 to over 6 hours and with tenure ranging from less than 5 to extra than 10 years. Heavy metals including chromium, along side its associated fitness concerns, have an effect on personnel extra often.

## 2.2 Context and working environment:

This study was undertaken in various dental workshops in Najaf Governorate to evaluate the health and occupational conditions experienced by workers in this sector. Several medical examinations were performed, including liver enzyme and kidney function assessments and measures of chromium metal levels, which have health implications due to prolonged exposure to materials utilized in this business.

## 2.3 Descriptive Study Design:

The study cohort was categorized into two groups: Dental workers exposed = 40; non-exposed workers = 20 As per: Hours of operation: A. Fewer than 6 hours = 29, B. More than 6 hours = 11.

Length of employment (years) A. Less than 5 years = 21

B. 6-10 years = 10

C. More than 10 years = 95.

## 2.4. Method of Collecting Blood Samples

Venipuncture Five milliliters of venous blood were extracted from the study population exposed to the polluted environment in dentistry laboratories and from the control group not exposed. The blood sample was aliquoted; 2 ml was transferred into serum tubes containing a gelatinous medium (gel tube) before analysis. We placed the tube in a water bath at 37°C for 5 minutes during the analysis to dissolve the gelatinous material. The mixture was subsequently centrifuged at 3000 rpm for 10 minutes to isolate the serum, which was then stored in fresh tubes. The serum was subsequently partitioned into two segments: the initial segment was utilized to assess liver enzymes (AST, ALT), whereas the latter segment was employed to evaluate kidney function (urea, creatinine). 1 cc of serum was additionally inserted in blood collection tubes to assess chromium levels (Koller, 2000).

## 2.5. Liver enzyme and Kidney Function Analysis

Following the collection of samples in gel tubes, liver and kidney function assessments were conducted with an Abbott Laboratories Automated Chemistry Analyzer. The majority of these assessments were conducted at Al-Sadr Educational City in Najaf. The tests encompassed the assessment of liver function through the evaluation of AST and ALT enzyme levels, and the measurement of renal function by the analysis of creatinine and urea levels (Turnover et al., 2008).

## 2.6 Extract and measurement of chromium in blood:

In the methodology of Jantzen et al. (2013), chromium metal was extracted from blood serum by diluting the sample with hydrochloric acid (HCl) solution, specifically by adding 750  $\mu$ L of HCl to 250  $\mu$ L of serum in a centrifuge tube. The sample was heated to 37°C in a water bath for 30 minutes to facilitate element extraction. Subsequent to mixing, we spun the material at 3000–5000 rpm for 10–15 minutes, filtered it via filter paper, and then utilized the clear fraction for examination via atomic absorption spectrometry. We calibrated the instrument to a wavelength of 240.7 nm for chromium and recorded its absorbance at designated wavelengths utilizing an AAS apparatus. We compute the optical absorbance, which correlates with the metal content in the sample. The serum's final metal concentration was ascertained by preparing various amounts of chromium metal as standard solutions.

## 2.7 Statistical Analysis

All statistical evaluations were conducted using SPSS 28.0 (SPSS Inc., Chicago, IL, USA). The clinical data for continuous variables is expressed as the mean  $\pm$  standard deviation (normal distribution) or the median (non-normal distribution). To assess the differences between groups, independent t-test or Mann-Whitney test was employed, and a variance analysis was conducted if there were more than three groups. The frequencies of categories and their percentages were evaluated using the chi-square test. To examine the association between variables, Spearman or

Pearson correlation coefficients were employed. All tests of significance were two-sided, and p values under 0.05 were considered significant. L. M. Sullivan (2003).

### 3. Results and Discussion:

#### 3.1 Liver enzymes.

Table 2.2 demonstrates the significant difference in the liver enzymes S. AST and S. ALT between the employees and the control group. The average S. AST value for the employees was 6.21 units/liter (U/L), with a standard deviation of 23.55, while the average value for the controls was 3.65 U/L, with a standard deviation of 20.18. The difference between the two groups was 2.56 U/l; this was significant (p value = 0.029) because it indicated that the S. AST level was significantly higher in the employees than in the controls. For S. ALT (or ALT), the average concentration of the workers was 10.51 U/l with a standard deviation of 25.87, while the average concentration of the controls was 4.77 U/l with a standard deviation of 22.27. The difference between the two groups was 5.74 U/l; the results demonstrated that the S. ALT level was higher in the workers than in the controls, and there was a significant difference, although there was no significant difference in the S. ALT level between the two groups. The comparison between dental lab workers and the control group showed significant differences in some chemical indices, specifically enzymes in the liver, these were significant for S. ALT and S. AST (Table 2). This discrepancy implies that the effects of occupational cobalt exposure are also capable of altering liver function. The results demonstrated a significant difference in the results of the enzyme S. AST between the two companies (P = 0.029), with the value of the dental laboratory employees (6.21 U/l) being greater than the control group (3.65 U/l). This difference suggests that the enzyme levels in the two companies are dissimilar and suggests that workplace exposure to beneficial compounds may also lead to liver damage or increase the stress on the liver. Studies have demonstrated that heavy metals can have a rapid effect on the liver (Yin et al., 2024). long-term exposure to cobalt can lead to increased levels of liver enzymes, including S. ALT, this is indicative of liver damage (Rasool et al., 2020). The results demonstrated that there was no significant difference in the S. ALT values between the employee group and the control group (P = 0.152). This discovery implies that occupational cobalt exposure has little or no significant impact on blood salt levels. The results indicate that cobalt doesn't have a direct impact on S. ALT levels in the liver. However, some research has demonstrated that biochemical indicators combined with S.ALT are effective at monitoring long-term damage to the liver (Chilay et al., 2023). Significant alterations in S.ALT levels may not be apparent immediately, but they may become apparent after being exposed to large amounts of steel for a long time period. Elevated ALT levels in dental laboratory employees can be caused by exposure to various environmental substances, including heavy metals like cobalt. These metals cause the liver to increase its activity of enzymes due to stress-induced oxidative damage, this can lead to an immune response in the liver. They adversely affect the liver's tissue, decrease the number of liver cells, and increase the level of ALT in the liver, for example, (Adetunji and Obeng-Gyasi, 2024).

**Table (2) The average and standard deviation of liver enzymes in employees and controls.**

Liver enzyme	Mean and $\pm$ Standard Deviation		
	Worker	Control	P.value
S. AST (U/L)	6.21 $\pm$ 23.55	3.65 $\pm$ 20.18	0.029*
S. ALT (U/L)	10.51 $\pm$ 25.87	4.77 $\pm$ 22.27	0.152 Ns

#### 3.2 Kidney Function.

Table 3 contrasts the renal function data, including creatinine and urea, of the workers and controls. The average concentration of creatinine in the workers was 0.21 mg/ dl, with a standard deviation of 0.66, while the average concentration of creatinine in the controls was 0.12 mg/ dl, with a standard deviation of 0.53. The discrepancy between the two groups was 0.09 milligrams of creatinine, which is significant due to the statistical difference in the level of creatinine between the employees and the control group. The average concentration of urea in the workers was 6.24 mg/ dl, with a standard deviation of 29.17, while the average concentration of urea in the controls was 5.07 mg/ dl,

with a standard deviation of 25.65. The discrepancy between the two businesses become 1.17 milligrams according to deciliter, which changed into enormous ( $P = 0.033$ ). The effects verified that the personnel' creatinine and urea concentrations have been higher than the controls, and each values have been extensively distinct. Creatinine is a byproduct of protein degradation and is expelled through the kidneys. A better creatinine stage is indicative of a diminishing function within the kidneys' activity of expel waste merchandise, this can result in harm or incapacity. Our studies is in line with different investigations, certainly one of which is with the aid of Santos et al. (2020) documented that those who were exposed to metals like cobalt and chromium in business settings had elevated creatinine stages due to the nephrotoxic results of those metals. Urea is a byproduct of the kidneys' excretion this is often indicative of the health and function of the kidneys. Elevated degrees of urea can lead to worse overall performance inside the kidneys, that is due to the fact the kidneys have a incapacity to efficaciously cast off waste products. Elevated levels of urea in people are suggestive of long-term publicity to heavy metals which may additionally result in troubles with the kidneys. This conclusion is in step with a research by Bayer et al. (2019) that verified that heavy metal poisoning can adversely affect the kidneys' potential to clear out blood, this could result in a buildup of uric acid inside the blood. Exposure to lengthy-term metals, inclusive of cobalt, can have loads of outcomes at the kidneys. One mechanism is extended oxidative pressure, as heavy metals interact with and damage the kidneys. These effects detrimentally have an effect on the kidneys' capability to clear out waste, this outcomes in an increase in the blood's creatinine and urea ranges (Modi et al., 2018).

**Table (3) Mean and  $\pm$  Standard Deviation of Kidney function for the workers and the control**

Kidney functions	Mean and $\pm$ Standard Deviation		
	Worker	Control	P.value
Creatinine (mg/mL)	0.21 $\pm$ 0.66	0.12 $\pm$ 0.53	0.006*
Urea (mg/mL)	6.24 $\pm$ 29.17	5.07 $\pm$ 25.65	0.033*

### 3.3 Chromium in blood:

Also, the amount of chromium (Cr) increased significantly with the number of years spent working. The concentrations of Chromium in the 5-year group were  $1.44 \pm 0.89 \mu\text{g/g}$ , while the 10-year group had a concentration of  $2.10 \pm 1.20 \mu\text{g/g}$ . The highest concentration was recorded in the 10-year group ( $3.37 \pm 1.30 \mu\text{g/g}$ ). The discrepancies between classes were significant ( $P = 0.004^*$ ) (Fig.1), which demonstrates the effect of job duration on increasing exposure to chromium, another element that is associated with industrial or environmental endeavors that may involve continuous exposure to individuals. The results demonstrate a significant difference in Cr levels between dental employees and the control group. These discrepancies suggest that workers are more exposed to this metal than the control group, this is clearly evident from the increased prevalence of health issues in this sector. The average and standard deviation values showed a significant difference in metal concentrations between the workers and the control group. Based on the aforementioned data, many scientists advocate the need for additional research to understand the long-term health effects of these metals. Studies, such as Jin et al. The investigation's (2018) primary concern was the association between heavy metal poisoning and respiratory diseases in the workplace, they also sought to educate employees about the dangers of exposure to these metals. Al-Saadi et al. The study by Schepke et al (2018) that examined dental technicians in Iraq demonstrated that the use of effective ventilation systems and the provision of personal protective equipment, such as masks, can significantly reduce the technicians' exposure to high concentrations of this toxic metal. The results in Figure 1 indicate that the technicians' exposure to chromium is significantly greater than the exposure of the control group. This significant difference ( $P < 0.001$ ) demonstrates that technicians were exposed to a higher concentration of chromium than controls that are healthy, this difference is indicative of the potential exposure of technicians to sources of chromium in the workplace and the need for preventative measures to protect the health of workers. Akgun et al. (2012) reported that long-term exposure to chromium can lead to serious health issues in industrial workers, including dental laborers. Dinesh et al. (2018) showed that dental professionals are exposed to high

concentrations of chromium due to their reliance on metal alloys, this increased risk of disease is caused by the profession. Al-Saadi et al. (2018) documented that the concentration of chromium in laboratory employees in Iraq was significantly greater than that of a comparison group, this demonstrated a link between employment and health issues. These findings indicate the potential for workers to be more exposed to these heavier metals over time, this would lead to long-term health effects. The results demonstrated a significant increase in chromium concentrations as the number of years worked increased. The concentration of Chromium in the group with less than 5 years of employment was 1.44  $\mu\text{g/g}$ , and increased to 3.37  $\mu\text{g/g}$  in the group with more than 10 years of employment. These discrepancies were significant ( $P = 0.004$ ). Chromium, especially in its hexagonal form (CrVI), is a toxic metal that can cause serious health issues, including respiratory irritation, kidney problems, and an increased probability of having cancer in the lungs. Levy et al. (2008) demonstrated that employees in the metal and alloy industry who are constantly exposed to chromium have various health effects, these effects are especially pronounced with long-term exposure..

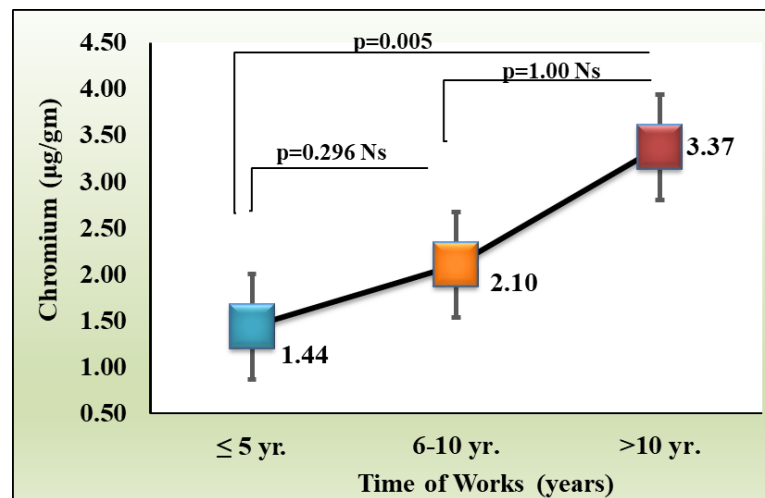


Figure 1: Mean chromium metal in blood according work duration

### 3.4 The effect working hours on laboratory parameters.

The results in Table 4 indicate no statistically significant differences in most measured parameters between those working less than 6 hours and those working more than 6 hours. There were no significant differences in liver enzymes (S. AST and S.ALT) between the two groups ( $P = 0.237$  and  $P = 0.254$ , respectively). As for creatinine and urea levels, the results were identical in both groups ( $P = 0.639$  and  $P = 0.836$ ), indicating no significant effect of treatment duration on kidney function. Therefore, levels of chromium (Cr) did not show any significant differences between individuals working less than 6 hours and those working more than 6 hours ( $P = 0.169$ , respectively). Based on these results, it can be concluded that work duration does not significantly affect most of the health parameters measured, indicating that there are no significant effects of the time individuals spend working on these variables. The analysis results in Table 4 indicate that working hours do not significantly affect most health parameters among dental laboratory workers. The role of working hours may be less influential compared to other factors such as exposure to toxic substances and heavy metals. In contrast, recent studies suggest that exposure to heavy metals such as chromium (Cr) may have a greater impact on the health of dental laboratory workers. This observe found no sizeable variations in cobalt degrees among those working less than 6 hours and those working extra than 6 hours, but this does not negate the capacity fitness dangers related to cobalt. On the opposite hand, several studies, together with Nagpal et al. (2017), have found that continuous publicity to heavy metals inside the place of work can also cause numerous continual health troubles which include metallic poisoning, specially if levels exceed permissible limits. On the other hand, lengthy working hours are believed to cause bad results on bodily and psychological health, along with strain, persistent fatigue, and an extended danger of health issues. These effects may be much less reported in the absence of direct exposure to toxic substances (Daniels, 2025). In addition, some research helps the concept that lengthy running hours can also lead to lengthy-time

period health problems if the work environment is wrong or consists of hazard factors which include poisonous substances. However, these elements are considered extra influential than the number of hours in keeping with day. Trubetskov et al. (2023) cited that long working hours may additionally boom exposure to poisonous chemical substances, contributing to long-time period health problems.

**Table 4.: Mean and  $\pm$  Standard Deviation of hematology parameters during working hours.**

Parameters	Mean and $\pm$ Standard Deviation		
	Less 6 hours.No.=25	More 6 hours .No.=15	P.value
S. AST (U/L)	6.02 $\pm$ 22.83	6.6 $\pm$ 25.45	0.237
S. ALT (U/L)	11.42 $\pm$ 27.01	6.86 $\pm$ 22.75	0.254
Creatinine (mg/mL)	0.22 $\pm$ 0.67	0.18 $\pm$ 0.64	0.639
Urea (mg/mL)	6.55 $\pm$ 29.04	5.37 $\pm$ 29.5	0.836
Cr ( $\mu$ g/g)	1.17 $\pm$ 1.86	1.56 $\pm$ 2.5	0.169

### 3.5 Relationship between chromium and some blood parameters

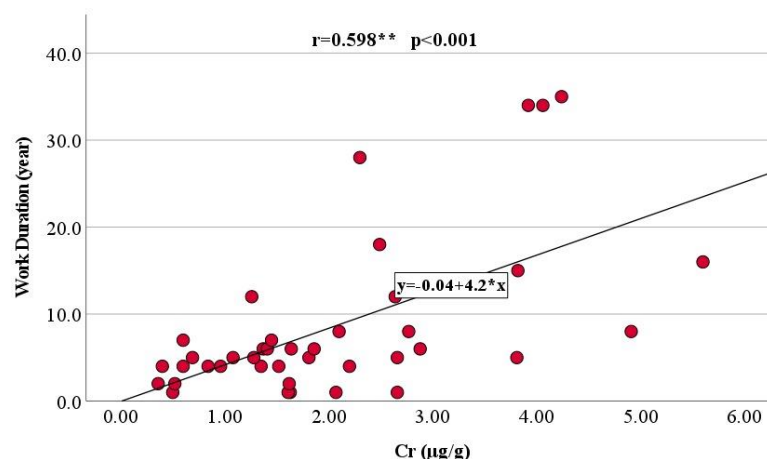
The results demonstrated that concentrations of Cr were significantly associated with various biomarkers of blood. The results showed a significant association between chromium and urea (0.361, P value = 0.022). This suggests that high concentrations of chrome can affect the volume of urea. There was no significant effect on the liver's enzymes, specifically S.ALT. This implies that the impact of chrome on these metrics is not significant. Overall, the investigation showed that being exposed to chromium had a significant effect on several critical parameters, including the concentration of urea, additional studies are necessary to understand the mechanisms behind these associations. This implies that the impact of chrome on these metrics is not significant. This is corroborated by the study of Alvarez et al. (2017) who studied the effects of chromium on the composition of blood in professional athletes. They found that long-term exposure to chromium led to changes in the blood, one of the most significant changes was an increase in the hemoglobin level as a result of the body's response to oxidative stress. However, occasionally, higher concentrations of urea are also caused by the toxic effects of the molecule on the kidneys. The investigation of Zhao et al. (2019) documented that chromium is capable of causing nephrotoxicity, this effect increases the concentration of urea in the blood. This research demonstrated the significant association between chromium and urea concentrations as a toxic effect of chromium on the kidneys, this effect would negatively affect the capacity of the kidneys to eliminate waste. Liu et al. (2016) also reported that being subjected to chromium on a regular basis can negatively affect the production of hemoglobin. The results showed that individuals who lived in environments with high chromium concentrations had higher levels of hemoglobin in their blood. This investigation suggests that long-term exposure to chromium may lead to an increase in hemoglobin in the blood, this increase is caused by the stress associated with the chemical. Other biomarkers, such as B. liver enzymes, had a significant association with chromium levels, this may suggest that the effects of chromium are specific to a particular part of the body, such as the blood and kidneys. Wong et al.'s investigation (2018) showed that some biomarkers had a less acute or more easily mutable response to external triggers than others.

**Table (5) Relationship of chromium with some blood parameters**

Parameters	Cr ( $\mu$ g/g)	
	R	P-value
S. AST (U/L)	0.135	0.406
S. ALT (U/L)	0.159	0.326
Creatinine (mg/mL)	0.157	0.334
Urea (mg/mL)	0.361*	0.022
**. Correlation is significant at the 0.01 level (2-tailed).		
*. Correlation is significant at the 0.05 level (2-tailed).		

### 3.6 Relationship between chromium metal (Cr) and working life:

Figure (2) displays the relationship between body chromium (Cr) concentration and work duration. There is a positive linear relationship between the two variables, albeit less severe than for cobalt. The regression coefficient (4.2) indicates that every 1  $\mu\text{g/g}$  increase in chromium levels leads to a 4.2-unit increase in the dependent variable. These results indicate that higher chromium levels are associated with an increase in the dependent variable, which may indicate that exposure to this metal has a certain effect on the studied factor. However, the presence of some outliers may require additional analysis to assess the strength of the statistical relationship and the extent to which it is affected by confounding factors. The correlation coefficient ( $r$ ) value is 0.598, a positive value indicating a moderate positive association between blood chromium concentration and years of work. This statistic means that, in general, blood chromium concentrations of workers tend to increase with increasing years of work in the laboratory. The probability value ( $p$ ) is less than 0.001 ( $p < 0.001$ ), indicating that this positive association is highly statistically significant. This means that the probability of this association being due to chance is very small and that there is a true relationship between the two variables in the study population. During their work, dental laboratory workers encounter a variety of chemicals and heavy metals, including chromium. Chromium is used in the manufacture of many dental prosthetics, such as crowns, bridges, and partial dentures, often in the form of various alloys (e.g., cobalt-chromium and nickel-chromium alloys). Inhalation of fine particles and particles containing chromium into the air during the grinding, polishing, and finishing process. Workers can inhale these particles, resulting in chromium absorption through the respiratory tract and into the bloodstream (Lyon, 2014; Abadin et al., 2012) Dermal exposure to chromium can occur while handling raw materials or dental prosthetics containing chromium. Although dermal absorption of chromium may be less effective than inhalation, it can contribute to the overall chromium load in the body over time ([Baral & Engelken, 2002). Although less common, accidental ingestion of fine chromium particles can occur during laboratory work. The positive correlation between blood chromium concentration and years of employment suggests a gradual accumulation of chromium in the body as workers continue their jobs in dental laboratories. Although the body can eliminate chromium, prolonged and chronic exposure may surpass its ability to do so completely, resulting in increased chromium levels in the blood and other tissues over time. (Omrane et al., 2018).



**Fig.2: Relation chromium metal with work duration**

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