

Assessment of Certain Biochemical Parameters Among Petrol Station Workers in South Babylon City, Iraq

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Abstract

The current study aimed to know the effect of benzene and its components on some physiological features in the worker's blood at filling stations, as 50 blood samples were collected from people working at gas stations and in direct contact with benzene, and 50 blood samples were collected from people who don't work at gas stations and were considered a control group. Laboratory tests, including biochemical tests, were performed, including the estimation of total protein (TSP), determination of urea (B.U.) and serum creatinine, evaluation of enzyme effectiveness (AST, ALT, and ALP), the estimation of total bilirubin (T.S.B.), measurement of Gamma-Glutamyl Transferase (GGT), determination of electrolyte concentration (Na⁺, Ca⁺⁺, K⁺). The findings of the research of biochemical variables exhibited significant alterations in activity of the Gamma-Glutamyl Transferase (GGT), electrolyte concentration (sodium, calcium, potassium), and heavy metal concentration (lead, zinc, copper), as well as thyroxine (T3) concentration in the blood serum. The search results also showed there were no significant differences in the concentration of urea and creatinine, the activity of enzymes (AST, ALT, ALP), the bilirubin concentration, the total protein concentration, or the TSH-hormone concentration (TSH and T4) in the worker's blood and the control group.

Keywords: Biochemical Parameter, Liver functions, Filling stations, Babylon City.

1. Introduction

The biochemical activity of the body, represented by the functions of the kidneys, liver, and heart, is the most important thing in the life of the organism. Therefore, any external influence that causes damage to the first defect in these functions will lead to great physical damage to the vital activities of the body as a whole. Many studies have been conducted on the effect of some chemical compounds that are in direct contact with individuals in factories, stations, and refineries, and it was found that they have a significant impact on the occurrence of such damages. Study (1) showed an increase the concentration of urea, creatinine, uric acid, and protein in the blood of petrol station workers. As well as the imbalance that occurred in liver functions, represented by the increase in the effectiveness of each of enzymes (AST, ALT, and ALP), and in the study (13), it was shown that the increase in the concentration of lead in the composition of benzene has a strong relationship with the deficiency of creatinine. It was noted (16) that there was an increase in the activity of aminotransferase enzymes (ALT and AST) in the serum of experimental animals when exposure to benzene was increased and continued. A study (4) also found that exposure to 100 mg/kg of benzene causes an imbalance in enzyme concentrations (AST, ALT, ALP) and the CPK

enzyme in the liver and kidneys of laboratory rats. It was shown (14), however, that a change occurred in the tissues of both the kidneys and the liver, and they noticed an increase in the concentration of the glutathione S-transferase enzyme. Study (2) showed that lead acetate affected the biochemical components of the body, including albumin, AST, ACP, TSP, and LDH. The third study looked at the phenotypic and biochemical changes caused by lead poisoning in benzene on kidney and liver functions. According to the findings of the study (12), prolonged exposure to benzene increased the concentration of T4 hormone while decreasing the concentration of T3, TSH.

2. Materials and Methods

Blood samples were collected from people working at gas stations in the city of Babylon and its suburbs, as (50) blood samples were collected for workers and (50) blood samples were collected for non-working people at the stations as a control group to prove their health and physiological status. Each group of workers and the control had 5 ml of blood collected, which was then placed in clean, dry plastic tubes and centrifuged for 15 minutes at a speed of 3500 rpm to extract the maximum amount of blood serum. Total protein determination (6), total urea estimation (15), and total creatinine determination (7), measurement of Gamma-Glutamyl Transferase

(GGT) activity (17), the estimation concentration of electrolytes (11,18), the estimation concentration of heavy metals (19), and the estimation of thyroid hormones T3 and T4 and pituitary hormone TSH (10)[1].

3. Results and Discussion

The experiment was designed as a simple experiment because it is based on a single test factor, and the statistics were analyzed using electronic statistical program SPSS version (Ver.18) where the statistical analysis included descriptive statistics, graphs, and one-way ANOVA, as the Randomize Complete Block Design RCBD was used at the probability level ($P \leq 0.05$) (20).

The effect of exposure to benzene on biochemical variables

There were no statistically significant differences in the concentration of total protein in serum, as determined by the probability level ($P \leq 0.05$), as the concentration rate of serum protein in the workers and control groups was (8.06 and 7.75 gm / 100 ml) respectively, as shown in (Figure 1). It was found that there was a non-significant increase, which accords with the findings of the study (1).

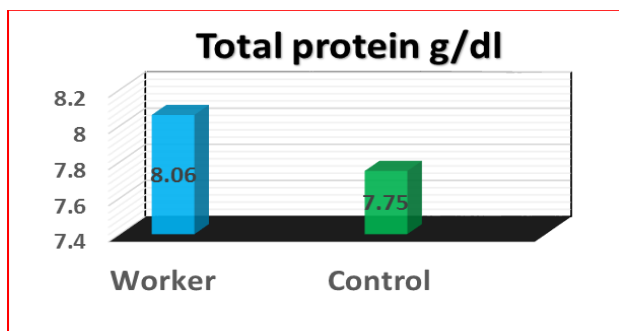


Figure1: The average of Total protein concentration.

The results also showed that there were no significant differences in the serum urea concentration at the probability level ($P \leq 0.05$), as the concentration rate of blood urea in the blood serum of the workers and the control group was (25.24, 25.03 mg/100 ml), respectively, as shown in (Figure 2). The significant and non-significant increase in the concentration of urea in the worker's blood may be due to the fact that benzene and its components caused a defect in kidney function as a result of continuous exposure, and these results agreed with a study (1).

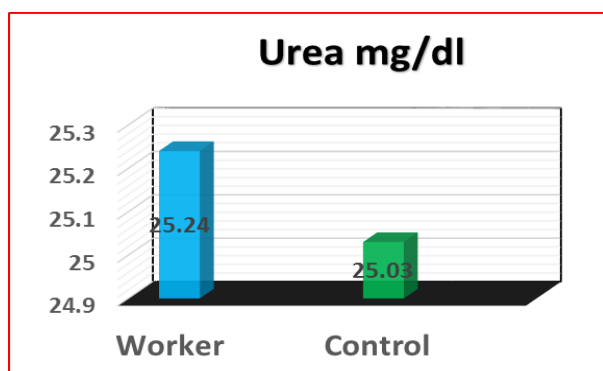


Figure 2: The average Urea concentration.

The results of the study also indicated that, at the probability level, there were no significant differences in the serum creatinine concentration ($P \leq 0.05$), as the concentration rate of creatinine in the worker's blood and the control group was (0.75, 0.72 mg/100 ml), respectively, as shown in (Figure 3). The concentration rate of creatinine in the worker's blood also increase compared with the serum creatinine of the control group, noting that the difference is small and within the normal limit, but the occurrence of the increase is also evidence of a defect in the kidney function of the workers due to the continuous exposure to benzene and its derivatives at the stations. The results agreed with the results Study (1) did not agree with the results (13).

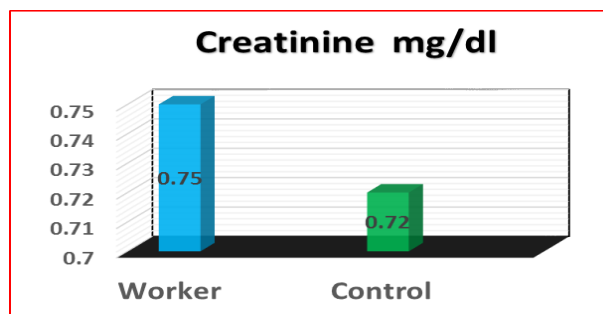


Figure 3: The average Creatinine concentration.

The study's findings also indicated that there were no appreciable variations in the activity of the enzyme transporting amino group ALT at the probability level ($P \leq 0.05$), as the average activity of the enzyme ALT for the worker's blood and the control group was (25.71, 21.27 IU / liter) respectively, as shown in (Figure 4). The apparent non-significant increase in the activity of the ALT enzyme in the worker's blood compared with its activity in the serum of the control group is due to the fact that continuous exposure to benzene has led to dysfunction in the liver and thus the occurrence of these changes in the activity of the enzyme. Both (1,16) not consistent with the study's findings (4).

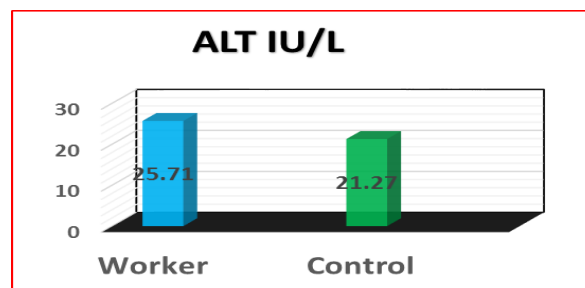


Figure 4: The average ALT concentration.

The results of the study indicated that, at the probability level, there were no significant differences in the activity of the amine transporter enzyme AST ($P \leq 0.05$), as the average activity of the AST enzyme for the serum of workers and the control group was (27.51 and 25.56 IU / liter) respectively, as shown in (Figure 5). The reason for this may be attributed to the fact that continuous exposure to benzene has led to dysfunction in the liver and the

heart, and thus the occurrence of these changes in the activity of the enzyme. These results agree on what came in the results of the studies of (1,16). It does not agree with the results of this study (4).

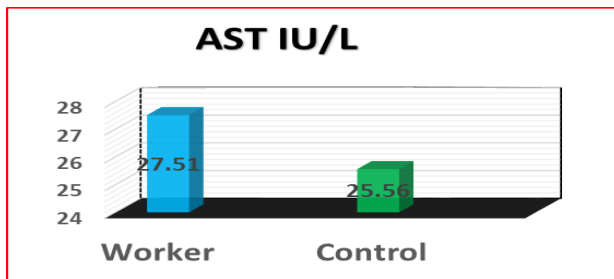


Figure 5: The average AST concentration.

The study's findings also indicated that there were no appreciable variations in the activity of the alkaline phosphatase enzyme (ALP) at the probability level ($P \leq 0.05$), as the average activity of the alkaline phosphatase enzyme for the blood serum of the workers and the control group was (71.13 and 73.53 IU / liter) respectively, as shown in (Figure 6). The increase in alkaline phosphatase enzyme activity in the control group is due to its value in the worker's group, because this enzyme expresses the functional activities of the liver and bones, and this is consistent with the results obtained by (4) and does not agree with the results of study (1).

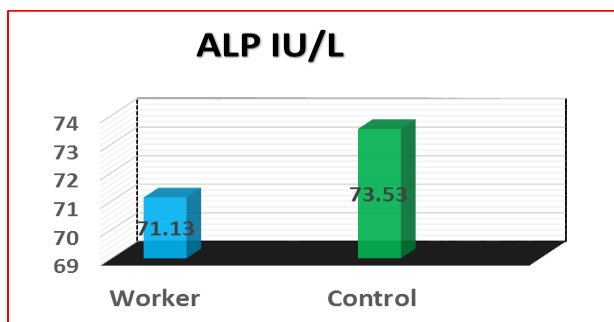


Figure 6: The average ALP concentration.

The study showed that there were no significant differences in the concentration of total bilirubin in blood serum in terms of probability ($P \leq 0.05$), as the density of total bilirubin in the serum of workers and the control group was (0.55 and 0.66 mg / 100 ml) respectively, as shown in (Figure 7).

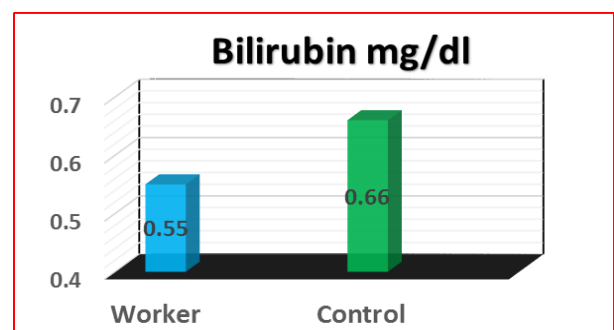


Figure 7: The average Bilirubin concentration.

The results of the study revealed significant differences in the enzyme activity of gamm-glutamyl transferase (GGT) at the likelihood level ($P \leq 0.05$), as the average activity of the gamm-glutamyl transferase in the blood serum of the workers and the

control group was (22.75 and 13.71 IU/ liter) respectively, as shown in (Figure 8). We note from the results that there is a significant and clear difference in the activity of the enzyme that transports glutamylase in the blood serum of the workers compared to its effectiveness in the blood serum of control, as it is one of important enzymes in the liver. Which works to transfer chemical groups from one part to another, and this increase is evidence of a defect in liver functions, whether acute or chronic. It may be cirrhosis of the liver or liver disease resulting from continuous exposure to benzene and its derivatives.

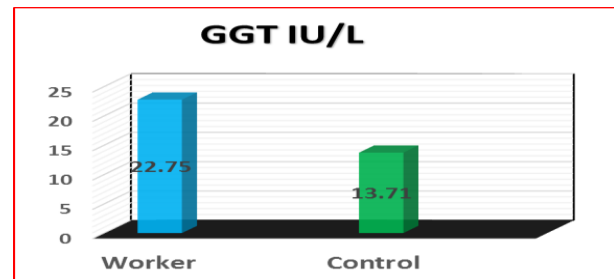


Figure 8: The average GGT concentration.

At the probability level, the results of the investigation indicated that there were substantial changes in the content of salt in the blood serum ($P \leq 0.05$), due to the pace at which sodium is concentrated in the serum of the workers and the control group was (129.85, 107.8 mmol / L) respectively, as shown in (Figure 9). The increase in sodium concentration may be due to the fact that the majority of workers in gas stations have skin or respiratory allergies, which leads to the use of cortisone drugs, and thus leads to an increase in the level of sodium in the blood[Fan, 2021 #16].

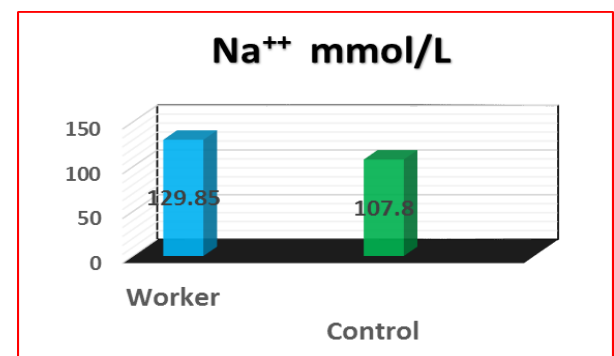


Figure 9: The average Na⁺ concentration.

The findings of the study also revealed that there were statistically significant differences in the participants' potassium levels in their blood serum when compared at the probability level ($P \leq 0.05$), as the concentration rate of potassium in the serum of the workers and the control group was (4.5, 4.1 mmol / L) respectively, as shown in (Figure 10). There is an increase in the concentration of potassium in the blood serum of the workers compared to the control group, and this is due to the fact that there is a malfunction of the kidneys or the occurrence of cases of necrosis of the tissues of the body, as a large amount of potassium comes out from inside the cells into the bloodstream, leading to an increase in its

level in the worker's blood[Deng, 2022 #35].

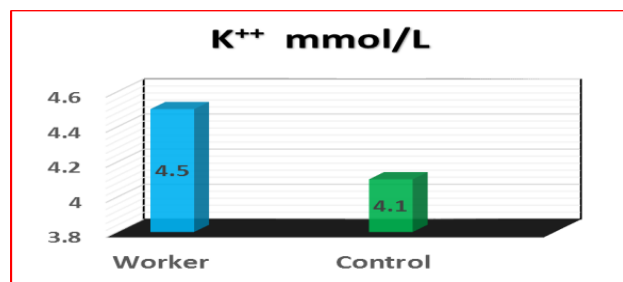


Figure 10: The average K⁺ concentration.

According to the findings of research, there were statistically significant changes between the levels of calcium in the blood serum at both the 0.05 and 0.025 levels ($P \leq 0.05$), as the concentration rate of calcium in the blood serum of the workers and the control group was (7.851, 8.68 mmol / L) respectively, as shown in (Figure 11). The apparent decrease in the concentration of calcium in the blood serum of the workers compared to the control group may explain acute pancreatitis, acute and chronic renal failure, and sometimes diseases leading to poor digestion and absorption, that is, as we have noticed, there is a correlation between any defect that occurs in the functions of the kidneys and liver and the occurrence of a decrease in the proportion of calcium in Blood serum This is what we actually found in the blood of workers at petrol stations.

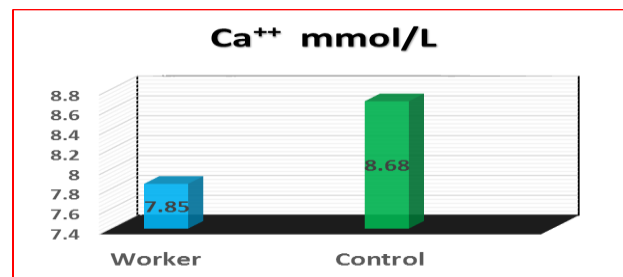


Figure 11: The average Ca⁺ concentration.

The results of the study showed that there were significant differences in the concentration of lead in the blood serum at the probability level ($P \leq 0.05$), as the concentration rate of lead in the blood serum of the workers and the control group was (1.51 and 0.51 mg / L) respectively, as shown in (Figure 12). As the continuous exposure to benzene through inhalation and contact, which contains among its components lead, led to an increase in the accumulation of lead in the blood serum, as the body does not get rid of it easily, and therefore it remains concentrated in the blood.

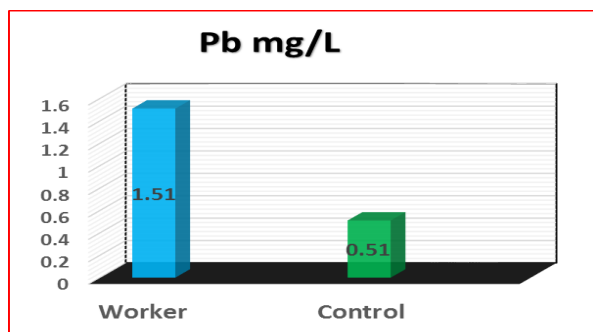


Figure 12: The average concentration of lead (Pb).

The results of the study indicated that there were significant differences in the concentration of zinc in the worker's blood compared to the control group at the level of probability ($P \leq 0.05$), as the concentration rate of zinc in the worker's blood and the control group was (1.05, 0.6 mg / L) respectively, as shown in (Figure 13).

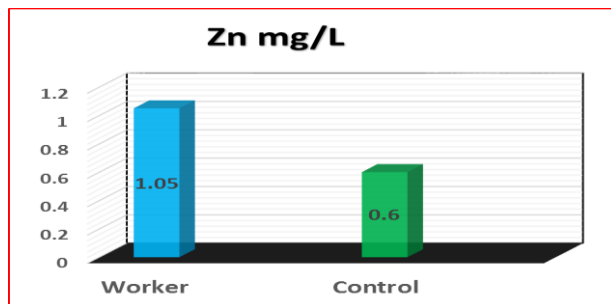


Figure 13: The average Zn concentration.

The results of the study also showed that there were significant differences in the concentration of copper in the blood serum of the workers compared to the control group at the probability level ($P \leq 0.05$), as the concentration rate of copper in the blood serum of the workers and the control group was (0.77 and 0.6 mg / L) respectively, as shown in (Figure 14).

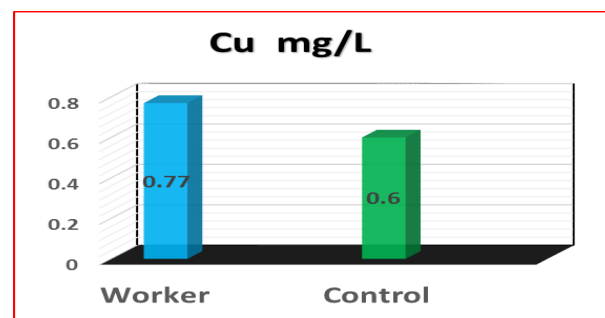


Figure 14: The average Cu concentration.

The results of the study showed that there were significant differences in the concentration of the thyroid hormone T3 triiodothyronine in the blood serum of the workers compared to the control group at the probability level ($P \leq 0.05$), as the concentration rate of the hormone T3 in the blood serum of the workers and the control group was (0.75, 0.64 mg / 100 ml) respectively, as shown in (Figure 15).

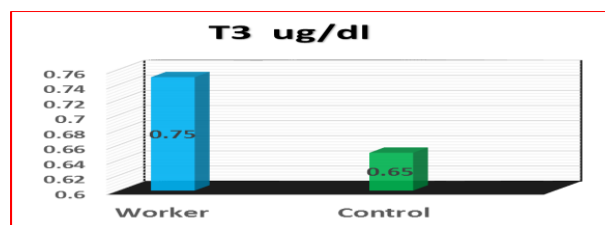


Figure 15: The average triiodothyronine concentration.

According to the results, the increase in the concentration of the T3 hormone in the blood of the workers over its percentage in the blood of control is probably due to the occurrence of thyroid dysfunction due to direct and continuous exposure to benzene by inhalation, or due to the high level of thyroxine-carrying proteins, and this is not consistent with the results of the study⁽¹²⁾.

The study's findings also indicated that there were

no appreciable variations in The concentration of thyroxine (thyroxine T4) in the serum of the workers compared to the control group at the probability level ($P \leq 0.05$), as the concentration rate of the hormone in the blood serum of the workers and the control group was (7.14, 7.69 micrograms / 100 mL), respectively, as shown in (Figure 16). This study's findings are inconsistent with what happened when it came to the concentration of T4 in the factor group's serum, which fell from its level in the blood of the control group. This may be because of hypothyroidism. ⁽¹³⁾

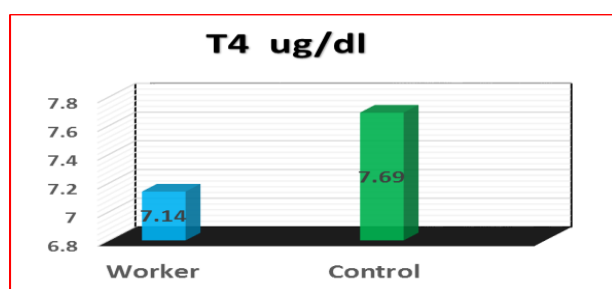


Figure 16: The average T4 concentration.

The study's findings also indicated that there were no appreciable variations in the concentration of the thyroid-stimulating hormone (TSH) at the workers compared to the control group at the probability level ($P \leq 0.05$), as the average concentration of the hormone in the blood serum of the workers and the control group was (2.29, 2.36 $\mu\text{g}/100 \text{ ml}$) respectively, as shown in (Figure 17).

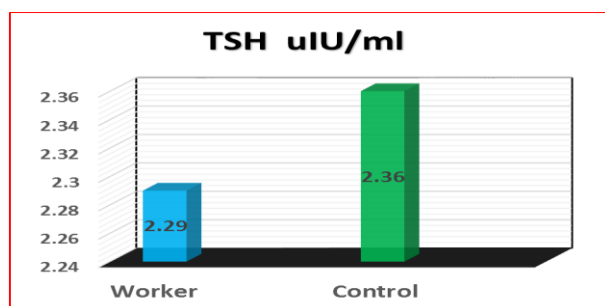


Figure 17: The average TSH concentration.

It is very interesting to clarify that this work confirms the previous data that show the importance of applied research in the nature (21-40).

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