



Effect of occupational exposure to chemicals on some biochemical parameters

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ABSTRACT

Chemical and biological hazards may have serious implications on the exposed individuals and a wealth of quality-ensured guidance and information for health care workers is available on the internet. Harmful chemicals can get into the body if you breathe, eat, or drink them or if they are absorbed through the skin. Study group was 20-person Exposure to Occupational Chemicals in chemistry department at Koya university for more than 5 years. In addition, the study includes 20 subject as control group in this study. The blood was drawn into test tubes to estimation of lipid profile, liver parameters, kidney function tests and heavy metal. Full automatic chemical analyzer (Cobas C311) was used to determine the biochemical parameters and atomic absorption was used to estimate the heavy metals. The results showed significant decrease in ALT, AST, albumin and triglyceride, and non-significant difference in total protein, total bilirubin, cholesterol, urea, creatinine, uric acid, Hg and Pb in case group as compared to control group.

1. INTRODUCTION

Chemical and biological hazards may have serious complications for the individuals exposed and a wealth of quality-ensured guidance and information for health care workers is available on the internet. These hazards may affect both physical and psychosocial health (Cox, et al., 2000). Although some chemical exposures are safe, others are not. Harmful chemicals can get

into the body during breathe, eat, or drink them or if they are absorbed through the skin. Liver is the main organ responsible for drugs and

toxic chemicals metabolism, so it is the primary target organ for many organic solvents. Some studies suggest that organic solvents can lead to liver toxicity. Presently, organic solvents are widely used in different chemical laboratory and industries including printing, paint and adhesives industries, rubber production, photographic films and toy manufacturing (Fiedler and Lerman, 2007). Some occupational liver diseases can represent with acute symptoms such as exposure to carbon tetrachloride and chloroform that lead to severe liver toxicity, but others can reveal chronic manifestations such as prolonged exposure to aromatic and aliphatic solvents which can result in mild liver toxicity (Ladou, and Harrison., 2014; Rosenstock, et al., 2005).

In the study of Malaguarnera, et al., some solvents including dimethylformamide (DMF), trichloroethylene (TCE), toluene, xylene, carbon tetrachloride, and chloroform were proposed as factors involved in hepatotoxicity (Malaguarnera et al., 2012). Environmental exposure to chemical substances is an important risk factor that effect on lipid metabolism in human's body (Santos-Gallego and Jialal, 2016). Lead is divalent metal is a ubiquitous pollutant of the eco-system. It find naturally in the earth crust as inorganic or organic compound (World Health Organization, 2001). It is soft malleable and grey in color. Lead has been persistently used for various purposes because of its peculiar chemical properties coupled with its poor ability to conduct heat and electricity (Xinteras, 1992). Lead is used in water pipes, cosmetic industries and as anti-knock in petroleum (Goyer, 1993). The metal enters the environment through soil, food, water and air (Enuneku, 2010; Haji and Amir 2012). Lead poisoning is a global health problem but it is unrecognized as such in a number of African countries. Lead poisoning as indicated by elevated blood lead levels have been observed in the general population in some parts of Nigeria (Santos-Gallego and Jialal, 2016; Xinteras, 1992). In adults, occupational exposure to lead is the most common cause of lead poisoning. This has been associated with adverse effect on the kidney, cardiovascular, haemopoietic and hepatic systems in humans (Onyeneke and Omokaro, 2016; Bartemaus and Jacobs, 2002; Paul, et al., 1999). The liver is a vital organ in the human body which is involved in detoxification and excretion of and product of metabolism glycogenesis etc. Occupational exposure to lead has been associated with abnormal liver function. There is therefore need to assess the blood lead levels in occupationally exposed individuals and also

to evaluate the effect of such blood lead levels on the liver.

2. MATERIALS AND METHODS

2.1. Study subjects

Study group was included 20-person Exposure to occupational chemicals in chemistry department at Koya university for more than 5 years. In addition, the study included 20 subject as control group in this study. The blood was drawn into test tubes for estimation lipid profile, liver parameters, kidney function tests and heavy metals. Full automatic chemical analyzer (Cobas C311) was used to determine the biochemical parameters while flame atomic absorption was used to estimate the heavy metals.

2.2. Statistical analysis

The results express as mean \pm S.E.M (stander error of mean). The results obtained were analyzed using student "t" test. Probably level of P value ($P < 0.05$) was considered as statistically significant.

3. RESULTS AND DISCUSSION

Chemical occupational workers are regularly exposed to many hazardous toxins and noxious vapors. Which they can cause abnormal alterations in the functioning of many vital organs (Ali Khan et al., 2013).

The current study was conduct at Koya university, Kurdistan Region which include chemistry teaching staff that are worked in chemistry laboratory 2 days per week at least 4 hours per day.

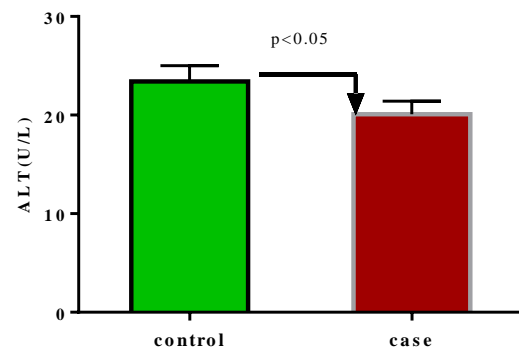
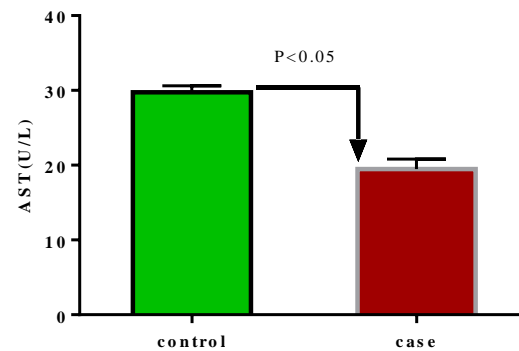
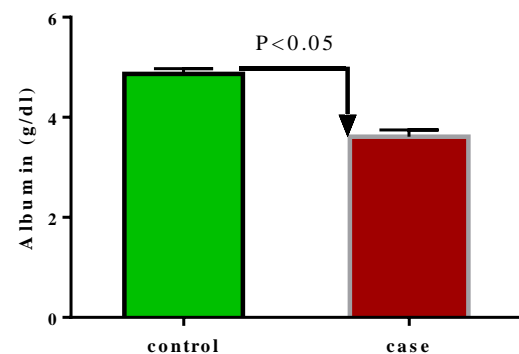
Table 1, show the results obtained in this study.

Table 1: biochemical parameters and heavy metal in case and control group

Parameters	Control group	Case group	P value
ALT (U/L)	23.41±0.532	20.08±1.330	0.028
AST (U/L)	29.75±0.866	24.50±1.308	0.001
Albumin (g/dl)	4.569±0.101	3.813±0.133	0.001
Total protein (g/dl)	7.429±0.134	7.489±0.222	0.073
Total bilirubin (mg/dl)	0.554±0.035	0.588±0.045	0.561
Cholesterol (mg/dl)	140.6±12.12	151.8±6.051	0.124
Triglyceride (mg/dl)	116.5±5.852	94.40±8.438	0.043
Creatinine (mg/dl)	0.657±0.024	0.698±0.025	0.273
Urea (mg/dl)	28.47±4.383	32.62±5.342	0.090
Uric acid (mg/dl)	4.450±0.178	4.735±0.324	0.422
Hg (mg/l)	0.043±0.004	0.040±0.004	0.081
Pb (mg/l)	0.014±0.001	0.014±0.001	0.804

Results expressed as Mean ±SEM

The table 1 show that subjects who were occupationally exposed to chemical substance showed that significant decrease in serum ALT and AST (20.08±1.330 U/L and 24.50±1.308 U/L respectively) as compared to its level in control group (23.41±0.532 U/L and 29.75±0.866 U/L respectively) as in (figure 1 and 2), while a significant decrease were found in mean level of Albumin (3.813±0.133 mg/dl) as compared to control (4.569±0.101 mg/dl), and non-significant difference in total protein and total bilirubin (7.489±0.222 mg/dl and 0.588±0.045 mg/dl respectively) as compared to its level in control group (7.429±0.134 mg/dl and 0.554±0.035 mg/dl respectively) as shown in figure (3, 4 and 5).

**Figure (1): ALT level in control and case group.****Figure (2): AST level in control and case group.****Figure (3): Albumin level in control and case group.**

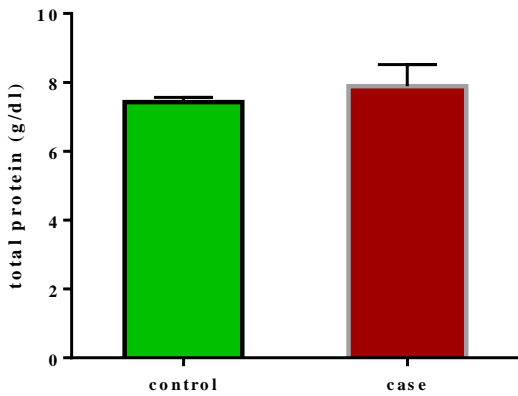


Figure (4): total protein level in control and case group.

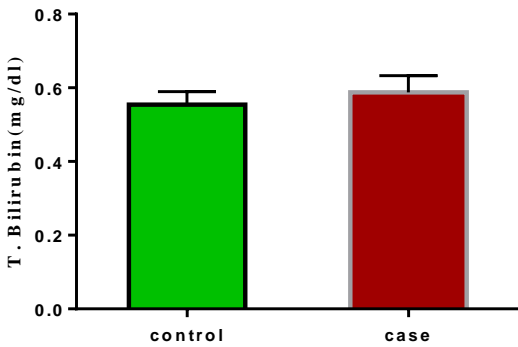


Figure (5): total Bilirubin level in control and case group.

There was significant increase in blood triglyceride levels of study group (94.40 ± 8.438) as compared to control (116.5 ± 5.852) as shown in (figure 6), and non-significant difference in cholesterol in case group (151.8 ± 6.051) as compared to control group (140.6 ± 12.12) as shown in (figure 7). The same results were found by Dere et al (Dere, et al., 2003).

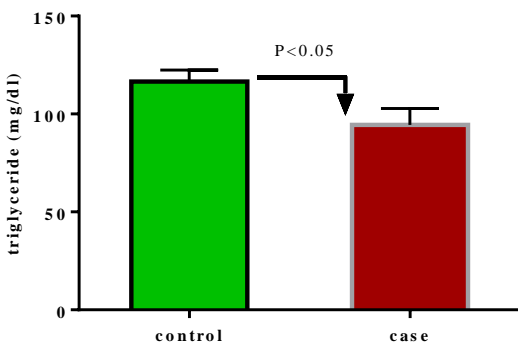


Figure (6): triglyceride level in control and case group.

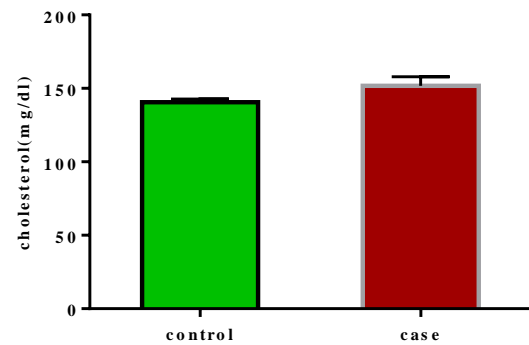


Figure (7): cholesterol level in control and case group.

Serum creatinine was within the normal ranges and had no significant differences in case group (0.698 ± 0.025) with those of controls (0.657 ± 0.024) as in figure 8. Serum levels of urea (32.62 ± 5.342 mg/dl) was shown to be non-significantly elevated in case group, more than comparison group (28.47 ± 4.383 mg/dl), though these values are still within the accepted normal ranges as in shown in (figure 9).

In the present study serum uric acid (4.735 ± 0.324 mg/dl) was non-significantly higher among the workers as compared to control (4.450 ± 0.178 mg/dl) as shown in figure 10. This finding is consistent with other which may be due to degradation of purines and pyrimidines or to an increase of uric acid level by either over production or inability of excretion (Abdel Aziz, et al., 2006). Whereas, serum creatinine (0.698 ± 0.025 mg/dl) was within the normal ranges and had no significant differences with those of controls (0.657 ± 0.024 mg/dl), this results are accepted with previous study (Abou-ElWafa, et al., 2015).

Most of chemical substances are toxic to many organ systems including the kidney (W. Qin, et al., 2012), which may be attributed to an increase in liberating toxic metabolites including reactive oxygen species. While experiments with rats indicate that exposure by

inhalation to the aromatic hydrocarbons toluene, styrene, and xylene was nephrotoxic (Rankin, et al., 2008), this effect has not been confirmed in man (Melnick, 1992). Both human and experimental studies suggest that many chemicals can affect the kidney (Pfaller and Gstraunthaler, 1998). The results obtained show that occupationally exposed subjects had non-significantly difference in Hg (0.035 ± 0.004 mg/l) and Pb (0.014 ± 0.001 mg/l) compared to its level in controls (0.043 ± 0.004 mg/land 0.014 ± 0.001 mg/l respectively).

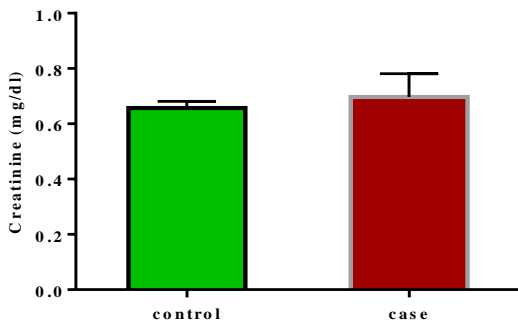


Figure (8): Creatinine level in control and case group.

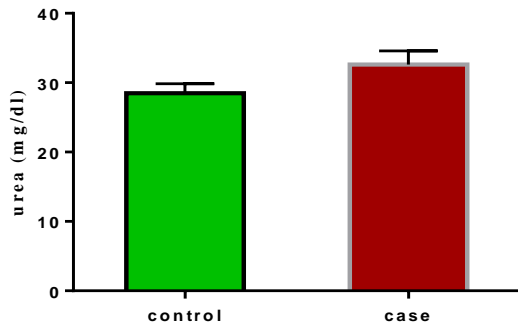


Figure (9): Urea level in control and case group.

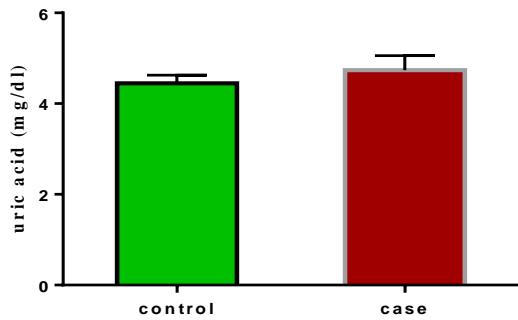


Figure (10): Uric acid level in control and case group.

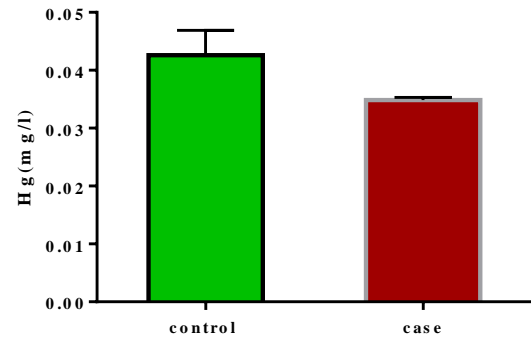


Figure (11): Hg level in control and case group.

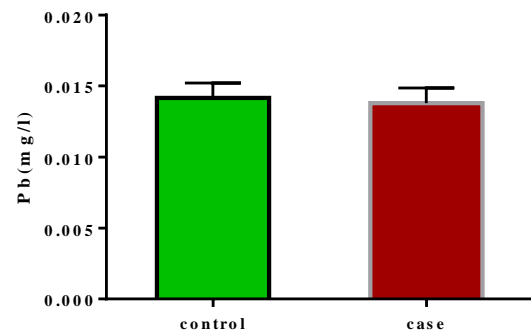


Figure (12): Pb level in control and case group.

4. CONCLUSIONS

The concentrations of serum ALT, AST, Albumin and Triglyceride were significantly lower among the workers. Whereas, normal levels of the serum total protein, total bilirubin, total cholesterol, creatinine, urea, uric acid, Hg and Pb were found among them. From these results, the Chemical exposure have significant effect on liver parameters, and non-significant effect on lipid profiles and kidney function test.

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