



## THE INFLUENCE OF CIGARETTE SMOKING IN SERUM LIVER ENZYMES

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### ABSTRACT

**Objective:** cigarette smoking is the largest preventable risk factor for morbidity and mortality in many countries. Remarkable increasing in the prevalence of cigarette smoking in Jordan in the recent years has been noted. The main aim of this study was to evaluate any possible association between the cigarette smoking and liver enzymes in Jordanian male population sample.

**Results:** the present study consists of 200 male patients (mean age  $49.5 \pm 14.2$ ). The control group includes 50 (mean age  $52.8 \pm 11.2$ ), there was a statistical significant increase ( $P < 0.05$ ) in HB ( $16.21 + 0.29$ ) and HCT ( $51.34 + 1.3$ ) of smokers in concomitant with the non- smokers ( $14.35 + 0.48$ ) and ( $42.71 + 1.82$ ), respectively. In liver enzymes analysis the  $\gamma$ - Glutamyl Transferase ( $\gamma$ -GT), Aspartate aminotransferase (AST), Alanine aminotransferase (ALT) and Total Bilirubin concentrations were significantly rose in male smokers in comparison with those non smokers ( $P < 0.05$ ).

**Conclusion:** The findings of this study show that cigarette smoking has effect on liver function which is reflected on the liver enzyme secretion level in blood serum

**Keywords:** Cigarette smoking,  $\gamma$ - Glutamyl Transferase, Aspartate aminotransferase, Alanine aminotransferase.

### Introduction

Smoking is one of the common causes of many diseases, and every 6 minutes one person dies in the world because cigarette smoking risks (1). Approximately, ten percent of the human mortality in 2012 resulted from smoking (2). To date, millions have died, and this rate expected to reach 9 million by 2035 (1, 2). Tobacco can be used as burning as cigarettes, which affects hematological parameters and the liver enzyme activity (3).

In a one single cigarette, there are more than 4000 materials, 200 of which are dangerous and poisonous and causing more than 80 types of cancer; like these poisonous substances include carbon monoxide, nicotine, nitrogen oxide, hydrogen cyanide and free radicals which produced disorders in the human body (4). carbon monoxide which is produce by smoking binds more with hemoglobin, so leading to many diseases, like blood pressure (5), hypoxia, anemia, blood viscosity (6,7,8) pancreas cancer, kidney cancer, colon cancer, liver cancer, lung cancer, (9) stroke, chronic obstacle pulmonary disease and heart disease (10).

In recent years the rate of using tobacco is increased and widely spread throughout the world; many major disorders are caused and enhanced by cigarette smoking and different kind of diseases that lead to death appear all over the world every year (11). So, the effects of cigarette smoking on human health is a critical health issues and in many cases causing death, about more than three million individuals die yearly because of the tobacco smoke (12). Smoking duration, number of cigarettes smoked daily, the degree of inhalation and initiation age, all these factors are increasing the risk of death in smoker

persons (13, 14).

There are many organs in human body which affected greatly by cigarette smoking, one of these organs is the liver which is very important for the metabolism processes, Glycogen storage and eliminating the harmful and toxic compounds, and drugs (15).

Several reports show interest in the liver function and especially the enzymes  $\gamma$ - Glutamyl Transferase ( $\gamma$ -GT), Aspartate and Alanine Transferase (AST and ALT). All these studies suggested that these enzymes can be useful as a bioindicator for predicting different kind of clinical results for the patients and healthy groups, and also to indicate if there is any damage or disorder in the function of the liver (16, 17).

So, our current study is devoted for the evaluation of relationship between the cigarette smoking and the physiological function of liver and the smoke effect on its secretion of enzymes, hematological parameters and their levels in blood serum.

### Method and Materials

#### Subjects and samples

This study was carried out on 200 male patients (mean age  $49.5 \pm 14.2$ ). The control group includes 50 (mean age  $52.8 \pm 11.2$ ), all patients were attending the out patients clinic at in King Hussein Medical Centre (KHMC) in Amman - Jordan during the period from September 2016 to February 2017, the members of both groups were enrolled in the study voluntarily. Before taking the sample we had to make sure that the volunteer has no disease to avoid the cases that may affect the secretion of liver enzyme and interfere with the results of our research. Ethical Committee approval

was obtained for the collection of samples from the subjects and all participants gave their written informed consent.

Venous blood samples were collected between 8:00 and 10:00 h into separated -jell tubes. The samples were allowed to clot for 15 minutes at room temperature then similarly were centrifuged at 4000g for 10 minutes then analyzed immediately for liver function test parameters. At the same time blood samples were collected for hematology analysis in EDTA tubes.

### Analysis:

Study was carried out in Clinical Chemistry Laboratory in Prince Iman Center for researches and lab sciences in KHMC in Amman - Jordan. Serum  $\gamma$ -GT, ALT, AST and Total bilirubin were measured using Cobas 501 auto-analyzer (Roche Diagnostics GmbH, Mannheim, Germany), the corresponding Roche Diagnostics kits were used in analysis of all parameters. Complete blood count was determined using Sysmex k 1000 hematology analyzer (Tao electronics, Japan).

### Reference range:

The normal references ranges for liver function tests parameters according to kits were ( $\gamma$ -GT: 0-38 IU/l), ALT (0-40 U/l), AST (0-40 U/l) and Total Bilirubin (0.2-1.2).

### Statistical analysis:

All statistical analysis were performed using SPSS for windows 20.0 (SPSS Inc. Headquarters, Chicago, Ill., USA) software program and Microsoft Excel 2007 program. Results are reported as mean  $\pm$  standard deviation ( $\pm$ SD), they observed differences in mean  $\pm$  SD values were analyzed for statistical significance using Student's t-test,  $p$ -value  $<$  0.05 was considered to be statistically significant

## Results

### Subjects

This study was carried out on 200 male patients (mean age 49.5  $\pm$  14.2). The control group includes 50 (mean age 52.8  $\pm$  11.2), all patients were attending the out patients clinic at in (KHMC) in Amman - Jordan during the period from September 2016 to February 2017.

### Biochemical results:

Liver function test measured liver enzymes by an auto human analyzer instrument for all smokers and nonsmokers. The AST concentration significantly ( $P <$  0.05) rose in male smokers in comparison with those non smokers, whereas there were no significant differences among the other groups (Figure 2). Serum ALT (29.78 +4.853), Total bilirubin (1.192 +0.144) levels were significantly higher ( $P <$  0.05) in smokers group (Table 1).

**Table 1: liver enzyme concentrations in smokers and healthy groups .**

	Smokers	Nonsmokers	P-value
N	225	50	0.43

Age (years)	49.5 $\pm$ 14.2	52.8 $\pm$ 11.2	0.035
ALT	32.3 $\pm$ 3.9	27.4 $\pm$ 3.1	0.016
AST	28.26 $\pm$ 2.89	25.87 $\pm$ 0.74	0.029
BILI-T	1.42 $\pm$ 0.67	1.13 $\pm$ 0.56	0.039
$\gamma$ -GT	2.75 $\pm$ 0.97	2.32 $\pm$ 0.66	0.041

### Hematological results

WBC, RBC HB, HCT and MCV were measured by full automated coulter count instrument for all volunteers' in both groups. Cigarette smoking caused a significant increase ( $P <$  0.05) in RBC in patients group in comparison with control group .Also, there was a statistical significant increase ( $P <$  0.05) in HB (16.21 + 0.29) and HCT (51.34 + 1.3) of smokers in concomitant with the non- smokers (14.35 + 0.48) and (42.71 +1.82), respectively. Additionally, MCV showed a statistically significant change ( $P <$  0.05) between the two groups (Table 2). The analysis also showed that white blood cell counts changed among all groups, but did not reach a statistical significance ( $P >$  0.05).

**Table2: Hematological parameters results of both groups.**

	Smokers	Nonsmokers	P-value
N	225	50	
Age (years)	49.5 $\pm$ 14.2	52.8 $\pm$ 11.2	0.035
WBC	5.3 $\pm$ 2.8	23.4 $\pm$ 4.1	0.16
HGB	16.21 + 0.29	14.35 + 0.48	0.018
HCT	51.34 + 1.3	42.71 +1.82	0.039
MCV	91.7 $\pm$ 1.17	86.39 $\pm$ 3.87	0.041

### Discussion

Cigarette smoking is a major cause of preventable morbidity and mortality (18). Worldwide, more than 3 million people currently die each year from cigarette smoking (19). The risk of death in the smokers measured by the number of cigarettes smoked daily, the duration of smoking, the degree of inhalation and the age of initiation (20, 21). Cigarette smoke contains over 4000 different chemicals, 200 of which are proven to be carcinogenic; it also contains various oxidants such as oxygen free radicals and volatile aldehydes which are probably the major causes of damage to bio-molecules (22).

Cigarette smoking yields chemical substances with high cytotoxic potentials (23). Cigarette smoke consists of many chemicals, including nicotine, tar with its many carcinogens, and gaseous compounds including carbon monoxide (24). Cigarette smoke also contains large numbers of free radicals that are capable of initiating or promoting oxidative injury (25). Cigarette smokers are at greater risk for cardiovascular diseases, respiratory disorders, cancers, peptic ulcers and gastro-esophageal reflux disease, blindness, bone matrix loss, and hepato-toxicity comparing with non-smokers (26). Cigarette smoking causes a variety of adverse effects on

organs that have no direct contact with the smoke itself such as liver. The liver is an important organ that has many tasks; such as responsibility for processing drugs, alcohol and other toxins to eliminate them from the body (27, 28).

In the current study, we found a elevating in RBC level, because of the increasing in the partial pressure of CO<sub>2</sub> and CO gases in the blood by turn this leads to a decreasing in binding O<sub>2</sub> gas with the HB (29), which is directly contributes in RBCs production by stimulating the stem cell of the red bone marrow (30). Also, there was a significant (P < 0.05) rise in HB and Hct levels, in the male smoker group (Table 2).

It is known that if the number of red cells is increased, the HB and HCT level would increase as they proportionally change with RBCs (31). However, the size of red blood cells increased in the present study due to significant (P < 0.05) increases in MCV of the smoker group (Table 2).

The results showed a significant rise in serum ALT, and AST activity in cigarette smokers when compared to control group. This may occur due to nitrosative stress which is a condition that occurs when the production of highly reactive nitrogen containing chemicals, such as nitrous oxide, exceed the ability of the human body to neutralize and eliminate them. Nitrosative stress can lead to reactions that alter protein structure thus interfering with normal body functions (32, 33). Cigarette smoke contains a large number of chemical substances with hepatotoxic potential including nicotine.

Previous studies showed that current smokers revealed high when compared with non-smokers subjects (34) and people with high  $\gamma$ -GT levels smoked more(35), which was similar with that which was found in our study (Table 1). It was controversial whether smoking could affect AST and ALT activities. Some investigators mentioned ALT was increased by smoking (36), while recent studies argued that smoking did not influence AST or ALT, but  $\gamma$ -GT (37) in as our results we found that cigarette smoking effects all of these liver enzymes.

## Conclusion

Based on obtained results of this study cigarette smoking has effects on liver function which is reflected on the liver enzyme secretion level in blood serum ( $\gamma$ -GT ,ALT and AST) causing liver injury in smokers group . Therefore, it should carefully interpreted, and more studies on the mechanism of this influence is warranted.

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