Biochemical Changes of Serum Liver Enzymes (Aspartate aminotransferase, Alanine aminotransferase and Alkaline phosphatase) in Cigarette Smokers in Mosul.

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Abstract

Cigarette smoking cause many effects in human body. These effects can be studied by measurement of various biochemical parameters in the blood. In the present study (3) biochemical parameters (aspartate aminotransferase AST, alanine aminotransferase ALT, and alkaline phosphatase ALP) had been measured in blood of 139 apparently healthy volunteers, including 88 smokers (55 males and 33 females) and 51 nonsmokers as a control group, in order to investigate the effect of cigarette smoking on these liver enzymes, and comparison the mean enzymes activities between male and female smokers. It is found a significant increase of serum AST, ALT, and ALP activity noticed in smokers compared with nonsmokers, and no significant changes was found in mean activity of serum AST, ALT, and ALP between male and female smokers.

Introduction

Smoking is considered probably the largest single preventable cause of illness, disability and death in the world. Tobacco smoking affects many systems and biochemical parameters in the human body. Medical research has determined that smoking is a major contributing factor towards many health problems, i.e. cancer of the (lung, bladder, kidney & lip), pulmonary disease and cardiovascular disease (1), (2). During pregnancy, cigarette smoking increase the risk for low birth weight infant and infant mortality (3); also smoking affects some serum constituents such as cholesterol, high density lipoprotein (HDL) and uric acid (4), (5); therefore several serum enzymes are measured as available biochemical tests of liver diseases.

The activities of transaminase enzymes (aspartate aminotransferase AST, alanine aminotransferase ALT) and alkaline phosphatase ALP, are often measured. The transaminase enzymes function is to transfer the amino group from an amino acid, aspartate in the case of AST and alanine in the case of ALT to ketoacid, producing oxaloacetate and pyruvate respectively (6).

Both AST, ALT are located in the cytoplasm of the hepatocyte; an alternative form of AST is also located the hepatocyte mitochondria (5), (6). The enzymes AST and ALT are widely distributed throughout the body. AST is found mostly in the heart, liver, skeletal muscle, and kidney while ALT is found primarily in the liver and kidney with a lesser amount in heart and skeletal muscle (7), (8).

Damage to any of these tissues may increase plasma AST, ALT levels (9), (10). Alkaline phosphatase ALP is a group of enzymes that are capable of hydrolysing phosphate esters at alkaline PH (6). ALP is present practically in all tissues of the body, with the liver, bone, and placenta being especially rich in this enzyme (5), (11).

Materials and Methods

The study was conducted by 88 apparently healthy smokers person, which include (55 males and 33 females) the range of age from (23-60) years with a mean of age (41) years. The control group was 51 apparently healthy nonsmokers with the range of age (21-62) years with a mean of age (38) years. Complete information was obtained from each person. This information includes name, age, cigarettes number per day and duration of smoking.

The number of cigarettes consumed by smokers /day ranged from (13-25) cigarettes daily with a mean of (18) cigarettes per day; since the duration of smoking habit was ranging from (5-22) years with a mean of (15) years. 5 ml blood
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Samples were obtained by antecubital venipuncture.

The samples were transferred immediately into plain plastic tubes and were placed in a 37°C water bath for 10 minutes and centrifuged at 3000 rpm for 15 minutes to ensure complete separation of serum. Serum was used for the following measurements of serum liver enzymes (AST, ALT and ALP).

Serum AST, ALT activity was measured by colorimetric method (Reitman and Frankel) using kit (Randox / UK) (12). Determination of serum ALP activity was based upon the colorimetric method using kit (biomerieux / France) (13). Data were analyzed using unpaired t-test. The results were expressed as mean ± standard deviation (SD) & P <0.001 was considered as statistically significant (14).

Results

A comparison between the results of serum liver enzymes activity (AST, ALT and ALP) of the smokers and nonsmokers groups show that the serum AST, ALT and ALP activity in smokers is significantly increase in comparison with nonsmokers group ( P < 0.001 ) as shown in table (1).

Figure (1), (2) and (3) shows the effect of cigarette smoking on the mean of serum liver enzymes activity (AST, ALT and ALP) in smokers group in comparison with nonsmokers group. There is a significant increase of serum AST, ALT and ALP in smokers than that of nonsmokers group. The effect of cigarette smoking on serum liver enzymes activity (AST, ALT and ALP) in different sex is shown in table (2). The results show that the serum AST, ALT and ALP activity in male smokers is slightly higher than in the female smokers but the difference is not statistically significant.

Table (1): Effect of cigarette smoking on serum liver enzymes.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean ± SD</th>
<th>T-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum AST (U/L)</td>
<td>Nonsmokers group (n=51) 10.29±3.07</td>
<td>Smokers group (n=88) 19.30±7.03</td>
<td>-10.41</td>
</tr>
<tr>
<td>Serum ALT (U/L)</td>
<td>Nonsmokers group (n=51) 11.16±4.26</td>
<td>Smokers group (n=88) 21.02±7.79</td>
<td>-9.65</td>
</tr>
<tr>
<td>Serum ALP (U/L)</td>
<td>Nonsmokers group (n=51) 39.0±13.5</td>
<td>Smokers group (n=88) 50.6±9.49</td>
<td>-5.42</td>
</tr>
</tbody>
</table>

Table (2): Effect of sex on serum liver enzymes during smoking.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean±SD</th>
<th>T-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum AST (U/L)</td>
<td>Male smokers (n=55) 19.71±6.88</td>
<td>Female smokers (n=33) 18.61±7.34</td>
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</tr>
<tr>
<td>Serum ALT (U/L)</td>
<td>Male smokers (n=55) 21.25±7.66</td>
<td>Female smokers (n=33) 20.64±8.11</td>
<td>0.35</td>
</tr>
<tr>
<td>Serum ALP (U/L)</td>
<td>Male smokers (n=55) 51.09±9.96</td>
<td>Female smokers (n=33) 50.0±8.74</td>
<td>0.54</td>
</tr>
</tbody>
</table>
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Figure(1): Serum AST (U/L) of nonsmokers and smokers groups.

Figure(2): Serum ALT(U/L) of nonsmokers and smokers groups.

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![Bar graph showing Serum ALP (U/L) of nonsmokers and smokers groups.](image)

**Figure(3):** Serum ALP (U/L) of nonsmokers and smokers groups.

**Discussion**

The current study showed that smoking caused a significant increase in serum enzymes activity of AST, ALT and ALP has been observed in smoker volunteers compared to nonsmokers; (Figure 1, 2, 3). These results were in agreement with Dales et al. 1974 (1), Robinson and Whitehead 1989 (15) and Gordon 1993 (16) and this may attributed to the fact that cigarette smoke contains a large variety of compounds including nicotine, benzopyrene, tar, carbon monoxide, many oxidants and free radicals such as polonium -210 ,potassium -40 and radium -226 (17), that are capable of causing a pro-oxidant / antioxidant imbalance in the blood and tissues of smokers, so hepatocellular damage lead to release of enzymes into circulation (18).

Liver cell damage is characterized by release of enzymes particularly (aspartate AST and alanine ALT transaminase) from damaged hepatocytes into the circulation (9), (19).

By comparing the mean of enzymes activities between male and female smokers, no significant difference in mean activities of serum AST, ALT and ALP was noted; Table(2). It concluded from the above finding that the cigarette smoking has a relative risk of liver diseases. Finally , the research recommended to quit smoking habit.

**References**

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