

Cigarette Smoking and Serum Liver Enzymes

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Abstract

This project aims to study some of liver function represented by the enzymes GOT and GPT in smokers and non-smokers in a group consists of 25 smokers and 25 non-smokers in different ages, and to study the effectiveness of cigarette smoking on liver enzymes and liver functions by checking the secretion of the liver enzymes GOT and GPT and their levels in the serum. The study shows that heavy cigarette smoking was significantly associated with increased levels glutamic-oxaloacetic transaminase, or GOT (23 -48) mg/dl and glutamate pyruvate transaminase, or GPT (44-54) mg/dl ($P < 0.0001$) compared with non-smokers who had normal value for the above parameters.

Key words: Cigarette smoking, liver enzymes, liver function test, smokers.

الخلاصة:

يهدف هذا البحث الى دراسة بعض وظائف الكبد المتمثلة بانزيمي (GOT و GPT) لعينة تتكون من 25 شخص من المدخنين و 25 من غير المدخنين باعمار مختلفة ، ودراسة تأثيرالتدخين على الكبد ووظائفه وتأثيره على أفراس الكبد لانزيمي GOT, GPT وقياس مستوى كل منهما في المصل . وقد أوضحت الدراسة ان هناك ارتفاعا معنويا في مستوى انزيم GOT اذ تراوح بين (23 - 48) mg/dl وكذلك في مستوى انزيم GPT اذ تراوح بين (44 - 54) mg/dl عند المدخنين مقارنة بالأشخاص غير المدخنين اذ بقيت المعايير اعلاه ضمن الحدود الطبيعية.

الكلمات المفتاحية: تدخين السكائر, انزيمات الكبد, اختباروظيفة الكبد, المدخنين.

Introduction

The use of tobacco is increasing and widely spreading throughout the world, and 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 (Funk , 2006). So, the effect of tobacco on human body is a serious health issues and in many cases deadly, Currently about more than three millions individuals die yearly because of the tobacco smoke (Aurelio, 2005). The risk of the death among smokers depends on smoking duration, initiation age, number of cigarettes smoked daily, and the degree of inhalation (Janson, 2001; Lubin,2007). In the smoke of tobacco there are many harmful compounds with bad effect on the Human body, for example carcinogenic, cytotoxic compounds and different other compounds that work as an oxidants which including Oxygen free radicals and volatile aldehydes and this kind of oxidant substances may be responsible of the biomolecules damage (Yeh, 2008). There are many cytotoxic substances and chemicals in cigarette smoke which are directly responsible of the bad effect on the Human body, these substances include Nicotine, tar, gaseous substances, and all these compounds in cigarette smoke play important role in the toxicity carcinogens and harmful effects. Carbon monoxide is one of the most important gaseous compounds in cigarette smoke that is related to the harmful effects (Benowitz, 2007). There is also a large number of free radicals which is involved in the oxidative injury (David, 1996). Individuals who are smoking are always subjected to different diseases including respiratory system diseases because the respiratory system is indirect contact with the tobacco smoke, beside many other diseases including cancers, cardiovascular diseases, gastroesophageal, hepatotoxicity, and blindness (Spiro, 2005). The measurement of the

morality risk and the death risk in the smoking individuals are depending on how long the persons are exposing to the tobacco smoke and how many cigarettes they are smoking every day (Rahmioglu, 2009).

There are many organs in Human body which are not in direct contact with cigarette smoking but they are affected greatly, One of these organs is the liver which is very important for the metabolism, storing the Glycogen and it is also important for the process of eliminating the harmful compounds, alcohol, toxic compounds, and drugs from the Human body as it is the case of liver (Yu, 1997 ; Pessione, 2001).

Our project is devoted to determine how the liver and its enzyme secretion is affected by the cigarette smoke by checking the levels of the enzymes glutamic-oxaloacetic transaminase, or GOT and glutamate pyruvate transaminase, or GPT. So, our project is devoted for the evaluation of relationship between the smoke of tobacco and the physiological function of liver and the smoke effect on its secretion of enzymes and their levels in blood serum (Adams, 2008). Many chemical compounds, medications, drug compounds, cigarette smoke alcohol compounds, environmental factors, different kind of harmful substances, pollutants, which are present in the surrounding Environment and the Atmosphere. Our study is intended to figure out the effect of these substances on the liver's functions, the secretion of the enzymes and the level of the enzymes which can also alter the liver activity in the metabolism (Sharpe, 2001).

Many studies show interest in the liver function and especially the enzymes γ -glutamyl transferase (γ -GT), aspartate and alanine Transferase (AST and ALT). All these studies recommend that these enzymes can be used as indicators 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 (Nathwani, 2005; Bravi, 2007 ; Bravi, 2009).

There is a correlation between the cigarette smoke and alcohol use is a correlation, that causes cell injury in the liver and increases the enzyme level in the blood serum, for example a correlation is found between cigarette smoking and alcohol use and the enzyme γ -GT in the blood serum in the individual who is smoking and using alcohol for a period of time (Tanaka, 2007). This kind of correlation between cigarette smoking and alcohol use can be found in many people who smoke cigarette and drink alcohol frequently (Tanaka, 1998).

In this project we expand our attention to the enzymes AST and ALT and how they interact with γ -GT and to study if this interaction is mainly because of the enzyme induction (Breitling, 2009). The Liver function tests are useful to check if there is any damage in the liver or if there is any disorder in the liver function. Concerning the two enzymes, Glutamic-Oxaloacetic Transaminase (GOT) and Glutamate pyruvate Transaminase (GPT), Their levels are raising in the liver that is damaged by the (hepatocellular disease) which cause injury in the liver cell, that increases the level of the two enzymes (GOT) and (GPT) in blood serum (Wannamethee, 2008 and Etter, 2011).

The effect of smoking cigarettes on the liver is caused by many harmful chemicals and toxic compounds which present in cigarette smoke that cause liver damage represented by liver cell injury, and that increase the probability of chronic inflammation, liver diseases such as Hepatitis B, and C, and also high probability of the liver cancer and many other liver disorders like liver fibrosis (Karl, 2010).

Methods and Material

This project was done in Diwaniya province and it was conducted on (50) males their ages between (19–76) years, they were divided into two groups, the first group consists of 25 smoking persons and the second group consists of 25 non-smoking persons with different duration of smoking from (7 months to 52 years) , that includes heavy smokers and the modest smokers. 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.

The two groups (smoking persons and non-smoking persons) were chosen in close ages to be appropriate for the statistical study. People under the test are divided into smokers (who is smoking more than (20) cigarette daily) for more than one month (n=25) and non-smokers (n=25).

5.0 ml of blood were taken from each participant, and this 5.0 ml of venous blood were drawn by venipuncture using antiseptic for the skin (70% alcohol), and then the samples placed in a heparinized tubes, after that we made centrifugation to the blood samples at about three thousands round per minute for about 3-5 minutes and the plasma was separated, then the enzymes GOT and GPT were estimated. Statistical evaluation was performed to assess significant difference.

Statistical analysis

Statistical evaluation was performed to assess significant difference, and all the outcomes are considered the mean \pm standard deviation (SD), and our statistical analysis was done by the comparison between smokers and non-smokers which was performed by Student's t- test. We used the individual for determining the relationship between the parameters studied considering the $P \leq 0.05$ as the lowest limited of significant. (Lubin, 2007).

Results and Discussion

Heavy cigarette smoking (=60 cigarettes /day) was significantly associated with increased levels of glutamic-oxaloacetic transaminase, or GOT (23 -48) mg/dl and glutamate pyruvate transaminase, or GPT (44-54) mg/dl ($P < 0.0001$). Compared with non-smokers who had normal value for above parameters (table 1).

The (Fig.1) shows that both GPT and GOT have higher level in smokers if we compare them with non-smokers where ($P < 0.01$). Glutamate Pyruvate Transaminase, (GPT) and Glutamic-Oxaloacetic Transaminase (GOT) were significantly higher in smokers compared to that found in non-smokers ($P < 0.01$). According to the results in (Fig.1), the elevation in the levels of Glutamate Pyruvate Transaminase, (GPT) and Glutamic- Oxaloacetic Transaminase (GOT) because of the effectiveness of the tobacco smoke and its harmful chemical compounds on liver cells that lead to the liver cell secretion to the (GPT) and (GOT) enzymes through inflammatory pathways or due to aggravate the pathogenic effects of others compounds on the liver (Farsalinos, 2013).

Fig. (2) and Fig. (3), show that relatively higher elevation in the level of Glutamate Pyruvate Transaminase, (GPT) and Glutamic-Oxaloacetic Transaminase (GOT) in cigarette smokers when we compare them with non-smokers.

The enzyme that is important for producing energy is Alanine Aminotransferase (ALT), this enzyme is found in the liver and other tissues beside the liver but in less concentrations than its concentration in the liver, it is found for example in the heart and the skeletal muscles. This enzyme beside other liver enzymes can be used for the

detection of liver disorders, for example in the diagnosis of hepatitis and cirrhosis (Aubin, 2012).

Several investigations concerning osteoporosis proved the increasing levels of the ALP in blood serum in cigarette smokers, and this can be used as a marker for the Bone Turnover disease (Bertholon, 2013). So, the effectiveness of cigarette smoke on the level of the LTP could be associated with some extrahepatic mechanisms without showing any constant contribution with cigarette smoke in this project even after adjusting many factors (Brown, 2000).

High cigarettes consumption was correlated with low total protein and albumin levels. Taking a lot of coffee regularly will lower the level of AST in the blood serum. High coffee consumption lowered serum AST levels. Heavy cigarette consumption raised the level of GOT and GPT. Heavy alcohol consumption raised the level of the enzyme GOT, because of the correlation between the three factors: tobacco smoke, coffee consumption and alcohol use exhibit high level of correlation and interaction is found between these factors.(Burstyn I. (2014).

Conclusion

The findings show that cigarette smoking has effect on liver function which is reflected on the liver enzyme secretion level in blood serum, so, tobacco smoke may influence the functions of the liver by influencing the secretion of the liver enzymes GOT and GPT, causing liver injury in smokers group which were compared to none-smokers (i.e. control group). (Fig.1) shows that the level of GOT and GPT enzymes are higher in cigarette smokers when we compare them with non-smokers, and this may be related to the effect of smoking on the liver.

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Table (1) the levels of each of GPT and GOT in mg/dl in study groups.

	Volunteers	Level of GPT	Level of GOT
1	Smokers (n=25) Group 1	(44-54) mg/dl Mean (48.68) Std = 3.2624	(23-48) mg/dl Mean (35.28) Std = 6.387
2	Non-Smokers (n=25) Group 2	(16-20)mg/dl Mean (18) mg/dl	(14-19)mg/dl Mean (16.5)mg/dl

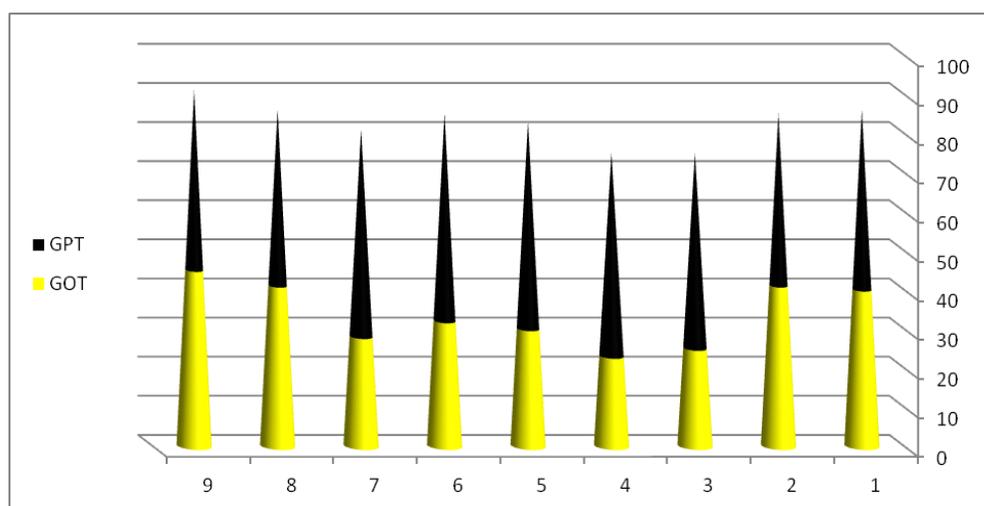


Fig.1 :The levels of GPT and GOT (mg/dl) for 50 volunteers

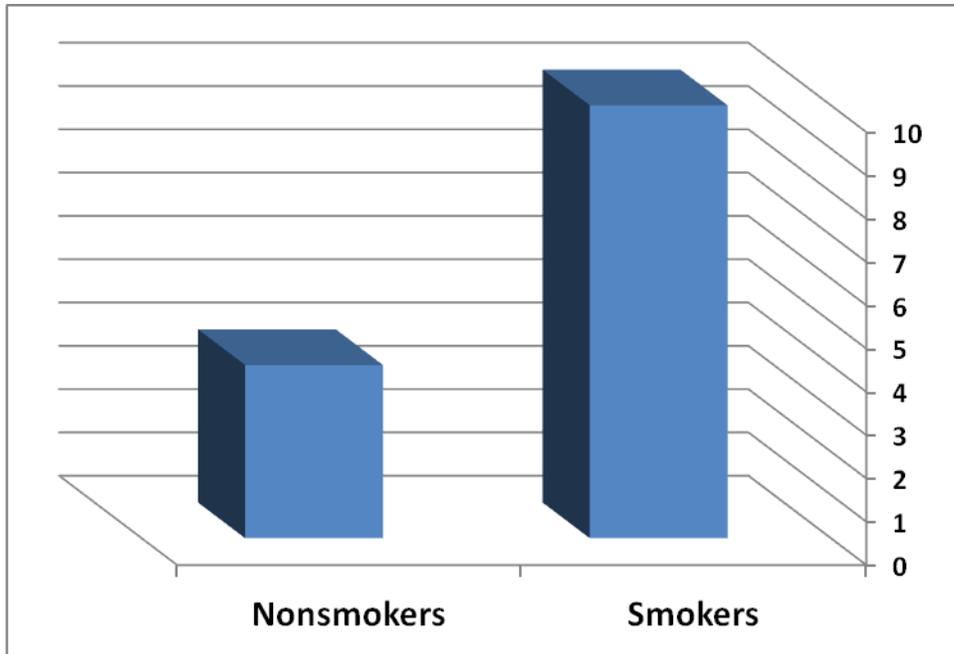


Fig.2: The levels of GPT (mg/dl)

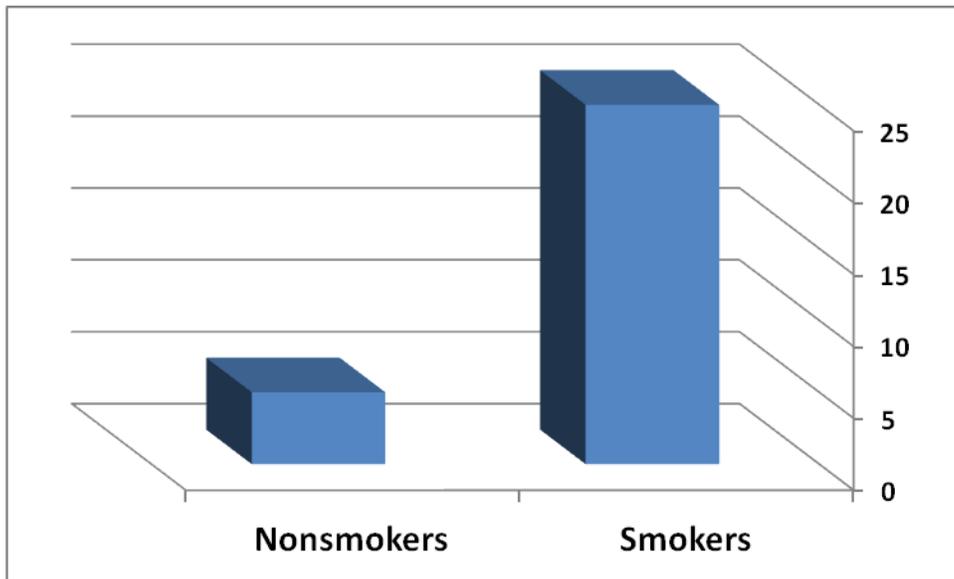


Fig. 3: The levels of GOT (mg/dl)