SUST Journal of Natural and Medical Sciences (JNMS) vol. 20 (1) June 2019
ISSN (Print): 1858-6805 e-ISSN (Online): 1858-6813

SUST
Journal of Natural and Medical Sciences
Journal home page:
http://Scientific-journal.sustech.edu/

Effect of Cigarette Smoking on Aminotransferase Enzymes Activities and Albumin Level among Sudanese Male Smokers

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Received: February2019 **Accepted: April 2019**

Abstract

Cigarette smoking has many serious effects on human body and influences many organs such as liver, and it causes hepatotoxicity. This study aimed to determine the effect of cigarettes smoking on Alanine aminotransferase (ALT), Aspartate aminotransferase (AST) activities and Albumin level in Sudanese cigarette smokers. A cross sectional study was conducted during the period from October 2016 to March 2017. A total of 70 cigarette smokers, and 30 non- smokers (as control group) participants were include. A structured questionnaire was designed to obtain demographic and clinical data. Venous blood samples were collected from all participants in heparin containers, assessment of AST, ALT activity and albumin levels done using semi-automated biochemical system international analyzer. The levels of albumin, ALT and AST for smokers and non smokers were (4.03±0.15g/dl, 17.94 Iu/L and 23.24±11.33 IU/L, 4.01±0.65 g/dl, 17.47±8.48 IU/L and 26.10±8.34 IU/dl), respectively. The results showed that insignificant difference in AST and ALT activity and Albumin levels in cigarette smokers compared to non-smokers was found, the level of AST was slightly reduced in a smoker compared to a non-smoker by about 10%. There was significan decrease in the level of albumin in a smoker who used more than 10 cig/day than who used 2-10 cig/day .This study concluded that, cigarette smoking has mild effect on liver function test.

Keywords: Sudanese smoker, Serum albumin, liver enzymes.

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Introduction

Cigarette smoking is one of the major causes of preventable morbidity and mortality. Worldwide, more than 3 million people currently die each year from cigarette smoking (Aurelio, 2005). 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 (Lubin *et al.* 2007). Cigarette smoke contains over 4000 different chemicals, 400 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 biomolecules, and other chemical substances with high cytotoxic potentials. It also consists of many chemicals, including nicotine, tar with its many carcinogens, and gaseous compounds including carbon monoxide (Benowitz *et al.*, 2007). Smoking causes a variety of three adverse effects on liver which include: direct or indirect toxic, immunological and oncogenic effect. The direct effect, smoking yield chemical substances which induce development of fibrosis. In direct effect of heavy smoking is associated with increased carboxyhemoglobin leading to tissue hypoxia which leads to accumulation of iron in macrophage and subsequently in hepatocyte over time promoting oxidative stress of hepatocyte. Smoking affects both cell-mediated and humeral immune responses, it also yields chemicals with oncogenic potentials such as hydrocarbons, nitrosamine, tar and vinyl chloride (El-Zayadi, 2006). In a study done by (Abdul-Razag and Ahmed, 2013) in Kirkuk province to evaluate the effect of cigarette smoking on liver function tests, they found that there were statistically significant elevation in serum ALP, ALT and AST activity in heavy smoker while serum total bilirubin, total protein and albumin significantly was lower compared to nonsmokers(Abdul-Razag and Ahmed, 2013). The present study aimed to investigate the effect of cigarette smoking on aminotransferase activity and albumin level among Sudanese smokers in Khartoum state.

Materials and Methods:

Study population

This is cross sectional study. The study was conducted on Sudanese smokers. The study was conducted in Khartoum state from October 2016 to March 2017. A total of 100 subjects from the study, 70 as smoker and 30 non-smokers as a control groups, were tested.

Data collection and Blood samples

Data was collected using structured questionnaire, and data from blood analysis for ALT, AST and albumin was recorded in the same form. Three ml of venous blood sample were collected by standard procedure from each volunteer. The blood was poured in heparinized container tube and centrifuged at 3000 rpm for 3 min. Plasma was removed in separated tube and stored for 1 week before analysis for AST, ALT and albumin.

Inclusion Criteria

A smoker males (aged 19 to75 years), beside a nonsmoker as controls, who voluntarily accepted to participate in this study were included.

Exclusion criteria

Volunteers with liver diseases, obesity, tobacco and alcohol administration, trauma or surgery, heart disease, skeletal muscle disease, extensive burns nephrotic syndrome, protein losing enteropathy, malnutrition, malabsorption, that have blood transfusion at least six months, and drugs user were excluded.

Statistical analysis

The mean standard deviation (SD), and the correlations between ALT, AST, albumin level, duration of smoking, and number of

cigarette were calculated. For all statistical comparisons a *P*-value of < 0.05 was considered statistical significant. All statistical procedures were performed using SPSS software, version 11.5.

Quality controls and managements

The cases were selected carefully. Blood was collected with care and adequate safety precaution to ensure test results are reliable. Quality assurance and standard operating system was followed for all biochemical tests to achieve validity and reliability of test results.

Ethical consideration

The study protocol was approved by institutional ethical committee of Omdurman Islamic University, Faculty of medical Laboratory sciences before initiation of the study. Informed consent was obtained from each participant before collection sample.

Results

The levels of albumin, ALT and AST statistically were insignificantly different (P> 0.05) between control and smokers. And, the levels of albumin, ALT and AST for smokers were 4.03±0.15g/dl, 17.94 Iu/L and23.24±11.33 IU/L, respectively, whereas control subjects reported 4.01±0.65 g/dl, 17.47±8.48 IU/L and 26.10±8.34 IU/dl, respectively. It was observed that the level of AST, was slightly reduced in cases as compared to control by about 10.2%, table (1). The level of AST was significantly (P< 0.05) increased in 20-30 years aged (27.16±14.18 IU/L) than in > 30 years aged (20.32±7.01 IU/L) by about 33.7%, whereas levels of both albumin and ALT were insignificantly affected by smokers age (P> 0.05), the age 20-30 year had slightly higher mean of albumin (4.13±0.72 g/dl) and ALT (18.66±12.40IU/L) than in >30 year (3.94±0.58 g/dl and 17.34±8.85 IU/L, respectively), with an increase estimated by 4.8% for albumin and7.6% for ALT table (2). The Levels of liver parameters statistically were insignificantly affected by duration of smoking (P> 0.05), but they were slightly elevated in 5-10 years duration (4.11±0.70, 18.08±11.63 and 24.68±13.95 for albumin, ALT and AST, respectively) than in > 10 year smoking duration (3.94±0.58, 17.79±9.38 and 22.06±7.37, respectively) table (3). The level of albumin was significantly (P< 0.05) higher in smokers of 2 -10 cigarettes/day (4.19±0.66 g/dl) than in those who smoked > 10 cigarettes/day (3.79±8.85) by about 10.6%, whereas ALT and AST levels were insignificantly affected by number of smoked cigarettes/day although they were slightly increased in smokers of 2-10 cigarettes/day than in > 10 cigarettes/day table (4). The correlation between albumin level and the levels of both ALT and AST was positive, weak and insignificant (P>0.05) , whereas it was negative, weak and insignificant with age, duration of smoking and number of smoked cigarettes/day, except with number of smoked cigarettes/day in which the correlation was significant (P< 0.05). On the other hand, ALT level had positive, weak and significant correlation with AST and insignificant with number of smoked cig. /day, whereas it had negative, weak and insignificant (P>0.05) correlation with both age and duration. Furthermore, AST level showed negative, weak and insignificant (P>0.05) correlation with age and duration, while it was positive with number of smoked cigarettes/day, table (5).

Table (1): Comparison between controls and smokers for the levels of Albumin, ALT and AST.

Parameters	Condition		*P - value*
	Control	Smokers	
Albumin (g/dl)	4.01±0.65	4.03±0.15	0.893^{ns}
ALT (IU/L)	17.47±8.48	17.94±10.56	0.828^{ns}
AST (IU/L)	26.10±8.34	23.44±11.33	0.251^{ns}

ns: No significant difference

Table (2): Levels of albumin, ALTand AST for cigarette smokers as affected by age.

Parameters	Age		*P - value*
	20 -30	>30 year	
Albumin (g/dl)	4.`13±072	3.94±0.58	0.229^{ns}
ALT (IU/L)	18.66±12.40	17.34±8.85	0.608^{ns}
AST (IU/L)	27.16±14.18	20.32±7.01	0.011*

*: Significant at 5%, ns: No significant difference

Table (3): Levels of albumin, ALT and AST for cigarette smokers as affected by duration of smoking

Parameters	Duration of smoking		*P - value*
	5– 10 years	>10 years	
Albumin (g/dl)	4.11±0.70	3.94±0.58	0.281^{ns}
ALT (IU/L)	18.08±11.63	17.79±9.38	0.909^{ns}
AST (IU/L)	24.68±13.95	22.06±7.37	0.339^{ns}

ns: No significant difference

Table (4): Levels of albumin, ALT and AST for cigarette smokers as affected by number of smoked cigarettes/day

Parameters	No. of cigarettes/day		*P - value*
	2- 10 cig.	>10 cig.	
Albumin (g/dl)	4.19±0.66	3.79±0.56	0.011*
ALT (IU/L)	18.19±10.23	17.57±11.21	0.812^{ns}
AST (IU/L)	23.79±12.86	22.93±8.77	0.759^{ns}

*: Significant correlation at 5%, ns: No significant difference

Table (5): Correlation between liver function test parameters and smoker social characters

Variable	r & P	Albumin	ALT	AST	Age	Duration	No.of cigs./day
Albumin	**r**	1	0.031	0.129	-0.163	-0.119	-0.244
	P	-	0.797^{ns}	0.287^{ns}	0.178^{ns}	0.326^{ns}	0.042*
ALT	**r**	-	1	0.295	-0.031	-0.058	0.050
	P	-	-	0.013*	0.802^{ns}	0.635^{ns}	0.679^{ns}
AST	**r**	-	-	1	-0.266	-0.198	0.052
	P	-	-		0.026*	0.101^{ns}	0.571^{ns}

*: Significant correlation at 5%, ns: No significant difference

Discussion

There are many evidences that smoking is harmful and lead to death. Worldwide, the effects of smoking are estimated to kill about 3 million persons per year (Tsuchiya *et al.*, 2002). This study conducted to study the effect of smoking on the activity of AST, ALT and Albumin level on Sudanese male smoker compared to control group. The results obtained from the present study indicated that, there was insignificant difference of AST, ALT and Albumin in the blood of smokers when compared with controls. This results were disagreed with study done by (Abdul-Razag and Ahmed, 2013), in which they found that there were significant low level of albumin and significantly elevation in AST and ALT in

Conclusion

This study demonstrates the insignificant differences on liver function test (Albumin, AST and ALT) in cigarette smokers compared with control group. Thus, cigarette smoking has mild effect on liver function, but albumin level, AST and ALT activities are affected by age, duration of smoking and number of cigarettes per day.

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