ORIGINAL ARTICLE

Assessment of Some Serum Liver Parameters among Sudanese Adult Cigarette Smokers, Omdurman City, Sudan (2019)

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Abstract

Backgrounds: Cigarette smoke contains a large number of chemical substances with hepatotoxic potential including nicotine. Many researchers have reported that, the relationship between cigarette smoker and liver injury.

Objectives: The objective of this study was to investigate the serum liver function tests among Sudanese adult cigarette smokers.

Methods: This study was an analytical case control study, carried out in Omdurman city, 100 subjects enrolled in the study matched for age and sex, 50 cigarette smokers as case group, with their age ranged between 18 to 43 years and the mean age was 24 years, and also 50 non smokers as control group, all study parameters estimated using spectrophotometric methods.

Results: The (mean ± SD) serum total proteins, albumin, total bilirubin, AST, ALT and ALP levels in cigarette smokers and non smokers respectively were (6.63±9.14g/L, 3.37±4.11g/L, 0.66±0.15mg/dL, 26.66±8.46 IU/L, 19.00±8.89 IU/L, 157.84±17.43 IU/L), (6.90±6.21g/L, 3.45±2.78g/L, 0.55±0.16 15mg/dL, 23.50±4.95 IU/L, 13.91±5.33 IU/L, 146.67±11.52 IU/L). There was statistically significant difference ($P<0.05$) between serum ALP, ALT and total bilirubin levels between smokers and control subjects. The age had a positive correlation with serum bilirubin, serum ALT and serum ALP respectively ($r=0.387$, $p=0.006$, $r=0.393$, $P=0.005$, $r=0.0318$, $p=0.025$).

Conclusion: Cigarette smokers had a significant increase in serum ALP, ALT and total bilirubin levels. This study also revealed a positive correlation between age and serum total bilirubin, ALT and ALP.

Key words: Cigarette smokers, liver enzymes, liver injury, Sudanese adult.

المستخلص

الخلفية: يحتوي دخان السجائر على عدد كبير من المواد الكيميائية الضارة للكبد مثل مركب النيكوتين، و قد أورد عدد من الباحثين بأن هنالك علاقة واضحة بين التدخين و أمراض الكبد. **أهداف البحث**: كان هدف هذه الدراسة هو فحص وظائف الكبد في دم مدخني السجائر السودانيين البالغين. **الطرق المتبعة**: كانت هذه الدراسة دراسة تحليلية وصفية محكمة للحالات المرضية، أجريت في مدينة أمدرمان؛ و احتوت على 100 متطوع متوافقين في العمر و الجنس، 50 منهم مدخنين كمجموعة حالة للبحث تتراوح أعمارهم بين 18 و 43 سنة وبمتوسط عمر 24 سنة، بينما 50 منهم كانوا غير مدخنين كمجموعة تحكم للبحث. كل فحوصات البحث قد أجريت باستخدام قياس الطيف الضوئي. **النتائج**: تم أخذ المتوسط الحسابي ±الانحراف المعياري لمعدلات الدم لكل من البروتين، الالبيومين، البيليروبين الكلي،الفوسفاتاز القلوي (ALP)،ناقلة امين الالانين(ALT)، ناقلة امين الاسباراتات (AST)، و التي كانت في مصل دم المدخنين بالترتيب كالآتي (6.63±9.14 جم/ل، 3.37±4.11جم/ل، 0.66±0.15ملجم/دسل، 26.66±8.46 وحدة دولية / لتر، 19± 8.89وحدة دولية / لتر، 157.84 ± 17.43وحدة دولية / لتر)، و كانت في مصل دم غير المدخنين كالآتي (6.9±6.21 جم/ل، 3.45 ± 2.78 جم/ل، 0.55±0.16 ملجم/دسل، 23.5±4.95 وحدة دولية / لتر، 13.91±5.33وحدة دولية / لتر،146.67±11.52 وحدة دولية / لتر). كان هناك فرق ذو دلالة إحصائية (P <0.05) بين ALP، ALT ومستويات البيليروبين الكلية بين المدخنين والأشخاص الغير مدخنين.كان للسن علاقة إيجابية مع مصل الدم لكل من البيليروبين، ALT و ALP على التوالي (r=0.387، p=0.006، r=0.393، P=0.005، r=0.0318، p=0.025). **الخلاصة**: كان في دم مدخني السجائر زيادة كبيرة في مستويات ALP و ALT ومستوى البيليروبين الكلي. كما كشفت هذه الدراسة أيضا وجود علاقة إيجابية بين العمر و البيليروبين الكلي ، ALT و ALP.

Introduction

Cigarette smoking is prevalent worldwide and it has been reported that approximately 1/3 of the adult population smokes tobacco [(1)]. The smoke of

tobacco contains numerous harmful chemicals, including, but not limited to, carbon monoxide, nicotine, nitrogen oxides and cadmium [(2)]. The deleterious sequelae of tobacco use are well recognized and the inherent health benefits of smoking cessation cannot be overstated. According to the World Health Organization, cigarette smoking was responsible for the death of 100 million people worldwide in the 20th century. And it remains a major public health problem in the 21st century [(3)]. Exposure of tobacco smoke has been considered as an important cause of preventable death worldwide [(4)]. Numerous studies have examined the relationships between cigarette smoking and lifestyle-related diseases, including type 2 diabetes, dyslipidaemia, hypertension, and cardiovascular disease. These studies' findings have demonstrated that these pathological conditions are negatively affected by cigarette smoking [(5)]. There is a growing direct evidence for the relation between exposure to mainstream and side stream smoke and diseases resulting from reactive oxidant challenge and inflammation as a consequence of the combined activity of neutrophils, macrophages, dendritic cells, eosinophils, basophils, as a humoral immunological consequence of sensitization [(6)]. Although the respiratory tract is the first target of cigarette smoke inhalation and cigarette smoking is a major risk factor for diseases of the airways such as chronic obstructive pulmonary disease, cigarette smoking causes a variety of adverse effects on organs that have no direct contact with the smoke itself such as liver, but very few studies take into consideration the effects of smoking in organs other than the respiratory system [(7)]. 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 [(7, 8)]. Cigarette smoke contains a large number of chemical substances with hepatotoxic potential including nicotine [(9)]. Basic and clinical research suggests that cigarette smoking affects the liver with numerous toxins in cigarettes altering enzymatic and inflammatory pathways in hepatic physiology [(10)]. Although smoking is not considered a causative agent for chronic liver disease, there is increasing evidence that smoking may negatively impact the incidence, severity, and clinical course of many types of chronic liver diseases, including the development of hepatocellular

carcinoma [11]. Longitudinal studies, demonstrated that cigarette smoking was a significant risk factor associated with the onset of fatty liver disease in individuals who did not consume alcohol, and that this significant association persisted after adjusting for the potential confounders. Moreover, the incidence of fatty liver disease in the nondrinker group increased significantly as the number of cigarettes smoked increased [12]. Laboratory liver tests are broadly defined as tests useful in the evaluation and treatment of patients with hepatic dysfunction. Some of the enzymes and the end products of the metabolic pathway which are very sensitive for the abnormality occurred may be considered as biochemical markers of liver dysfunction [13]. Few studies in literature were concerned with the effects of smoking in the liver and the present study was a trial to shed light to reveal the effects. The study was built on changes of metabolites and enzymes that reflect the activities of liver. Also in the present study some laboratory function tests were assessed for a group of heavy smokers, compared to a matching group of non smokers to clarify the toxic effects of smoking on liver. The objective of this study was to investigate the serum liver functions tests among Sudanese adult cigarette smokers.

Materials and Methods:

Reagents: All chemical reagents were purchased from Bios stem Company (Spain Company for Analytical Material and Chemical Reagents).

Study population and data collection: This study was an analytical case control study, carried out in Omdurman city, 100 subjects enrolled in the study matched for age and sex, 50 cigarette smokers as case group, with their age ranged between 18 to 43 years with a mean age 24 years, and also 50 non smokers as control group, Number of cigarettes/day ranged between 5-20 cigarettes. The study period from April to July 2019. Questionnaires data including age, smoker history, chronic disease, and number of cigarettes consumed per day. Five ml of blood were collected in a plain container from each case and control. The blood was centrifuged at 5000 r.p.m. for 10 minutes to separate serum. Levels of liver function tests in the serum sample obtained were estimated by conventional methods using spectrophotometer.

Inclusion and Exclusion Criteria:

The criteria of inclusion were conserved of the smokers with heavy smoking, non alcohol users and freedom from chronic diseases. The exclusion criteria consisted of those smoking was taken fewer than 5 cigarettes/ day or those of non continuous use.

Ethical Approval:

We obtained ethical approval to carry this study from the ethical committee of Faculty of Medical Laboratory Sciences, Omdurman Islamic university, Omdurman, Sudan.

Statistical analysis: All the results were analyzed by statistical analysis, using (SPSS) software (version16). t- test was used, and ($P<0.05$) value was considered significant.

Results:

The age of the study population and control were matched and ranged between (18-43 years) with their mean 24.20±4.63. Number of cigarettes/day ranged between 5-20 cigarettes. The (mean ± SD) serum total protein, albumin, total Bilirubin, AST, ALT and ALP levels in smokers and non smokers respectively were (6.63±9.14 g/L, 3.37±4.11 g/L, 0.66±0.15 mg/dL, 26.66±8.46 IU/L, 19.00±8.89 IU/L, 157.84±17.43 IU/L) , (6.90±6.21 g/L, 3.45±2.78 g/L, 0.55±0.16 mg/dL, 23.50±4.95 IU/L, 13.91±5.33 IU/L, 146.67±11.52 IU/L), respectively. While There was statistically significant differences ($P<0.05$) in serum ALP, ALT and total bilirubin levels between smokers and control subjects, and the data are presented in table (1). The age show a positive correlation with serum biluribin, serum ALT and serum ALP respectively ($r=0.387$, $p=0.006$), ($r=0.393$, $P=0.005$) ($r=0.0318$, $p=0.025$), are presented in figure (1, 2 and 3).

Table (1): Serum liver function tests among study populations (n, 100)

Parameters	**Smokers (Mean±SD) N= 50**	**Non Smokers (Mean±SD) N= 50**	***P-value***
Total Protein (g/L)	6. 63±9.14 mg/dL	6.90±6.21 mg/dL	0.158
Albumin (g/L)	3.37±4.11 mg/dL	3.45±2.78 mg/dL	0.382
Total Bilirubin	0.66±0.15 mg/dL	0.55±0.16 mg/dL	0.003

(mg/dL)			
AST (IU/L)	26.66±8.46 IU/L	23.50±4.95 IU/L	0.067
ALT (IU/L)	19.00±8.89 IU/L	13.91±5.33 IU/L	0.006
ALP (IU/L)	157.84±17.43 IU/L	146.67±11.52 IU/L	0.003
AST/ALT	1.60±0.79 IU/L	1.71±0.45 IU/L	0.488

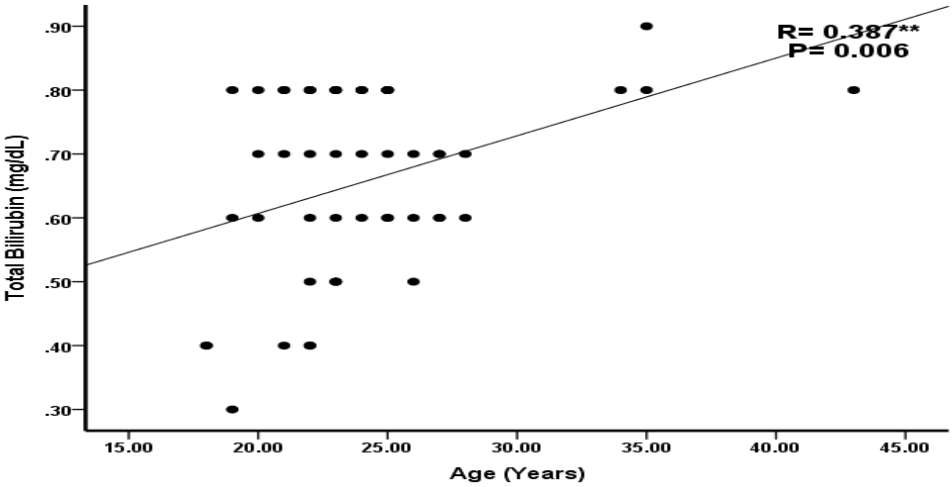

Figure (1): Positive correlation between age and serum total Bilirubin in cigarette smokers (n, 50)

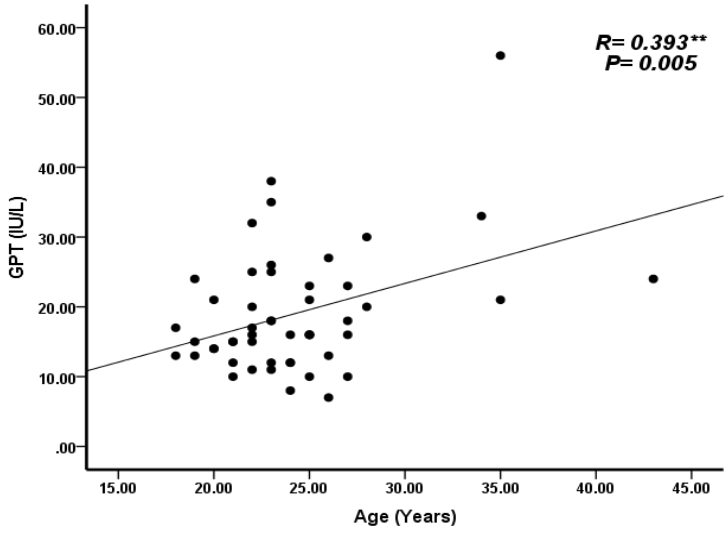

Figure (2): Positive correlation between age and serum ALT in cigarette smokers (n, 50)

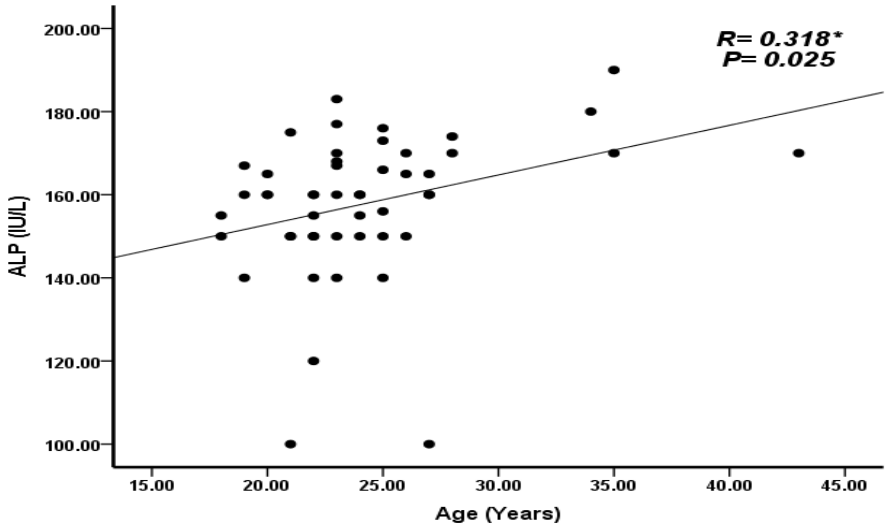

Figure (3): Positive correlation between age and serum ALP in cigarette smokers (n, 50)

Discussion:

Afew population studies have examined the relationship between smoking and enzymes measuring liver functions such as gamma-glutamyl transferase (GGT), alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) [(14)]. In the present study the level of serum total protein in smokers was found less than the level in non smokers, although the difference was insignificant (P>0.05).The serum albumin was also found insignificantly decreased. This agrees with the findings of Eun Sun Jang et al as they reported cigarette smoking diminished serum total protein and albumin [(15)]. Serum total

protein and albumin were significantly lower in heavy smokers compared to non smokers**.** Azzalini L, *et al* [16] reported significantly low level of total serum protein, and serum albumin in heavy smokers compared to non smokers. In the present study serum AST was insignificantly increased, while there is a significant increase in serum ALT. It was controversial whether smoking could affect aminotransferase activities. Some investigators claimed ALT was increased by smoking [17] while other studies argued that smoking did not influence AST or ALT, [18] Eun Sun Jang et al found significant increase in the level of alanine transaminase (ALT) and aspartate aminotransferase(AST) activities in heavy smokers compared to non smokers [15]. Azzalini L *et al* [16] reported a statistically significant elevations in serum alanine transaminase (ALT) and aspartate aminotransferase (AST) activities in heavy smokers compared to non smokers. Studying the effects of smoking on liver S Goya, and Gerald Shaper reported increased level of AST**.** Sangar Najat Abdul-Razaq, Bakhtiar M. Ahmed found high level of in serum alanine transaminase (ALT) and aspartate aminotransferase(AST) activities in heavy smokers compared to non smokers [20].In the present study the level of ALP was found significantly highly ,that matches the findings of Sangar Najat Abdul-Razaq ,and Bakhtiar M. Ahmed .Their results showed that serum ALP was significantly high (P value<0.05) in heavy smoker group when compared with non smokers group[20]. Goya, and Gerald Shaper found that cigarette smoking was significantly associated with increased levels of ALP ($P < 0.0001$. Hie-Won Hann, *et al* observed an increase in ALP level amongst heavy smokers. [21].This study revealed significant increase in serum total bilirubin levels between smokers and control subjects which may be a result of smoke toxic effects on liver. It was fairly established that smoking increases the production of pro-inflammatory cytokines (IL-1, IL-6 and TNF-α) involved in liver cell injury [22]. Our study recommended that, the cigarette smoker needs to assess the liver function test routinely.

Conclusion

Cigarette smokers had a significant increase in serum ALP, ALT and total bilirubin levels. This study also revealed a positive correlation between age and

serum total bilirubin, ALT and ALP.

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