Study of Smoking Effect on Some Liver Functions, Blood Pressure and Some Haematological Parameters in Smokers in Al-Muthanna Province

Duaa Hamad Hamza[1], Wafaa Abdulmutalib Naji[2]

[1] Assist.lecturer, [2] Lecturer Department of Biology; College of Science , University of Al-Muthanna, Iraq

Abstract

The aims of this study was to investigate the changes that occurred on some liver functions and some haematologicl parameters and blood pressure of smokers**.** The current study is carried out in in Al- Muthanna province.The study included 200 men, (100) smokers and (100) non smokers (control).the smokers and non smokers divided to two group according to age. the ages were between (25-46)years.The results for liver function indicate a significant increase at($P<0.05$)in Glutamate Oxaloacetae Transaminase(GOT),Glutamate Pyruvate Transaminase(GPT) and Alkaline Phosphatase (ALP) levels of smokers comparing with control group in two age groups ,but non-significant differences at ($P<0.05$) in Serum Total Bilirubin (STB) of smokers comparing with control group, While the results for haematological parameters showed a significant increase at($P<0.05$) in white blood cells (WBC), red blood cells(RBC), hemoglobin(Hb) and Mean Cell Volume(MCV)of smokers comparing with non-smokers in two age groups, but non-significant differences at($P<0.05$) in PLT of smokers comparing with non-smokers in two age groups. the results for blood pressure showed a significant increase at($P<0.05$) in in systolic and diastolic blood pressure in all age groups of smokers comparing with non-smokers.

Key words *:Smoking, liver functions , haematological parameters , blood pressure.*

Introduction

Smoking is the most important public health problem. Tobacco cigarette is one of the major causes to death and essential public health challenge in world over, many studies showed the effects of smoking on many organ systems mostly respiratory, reticulo-endothelial system and cardiovascular systems [(1)].WHO estimates that tobacco-related deaths will amount to 8.3 million in 2030 and one billion deaths during the 1st century. Water-pipe (WP) is a classical device used for tobacco smoking attached with water bowl, WP usage has a history about 400 years with the different names like as a shisha, narghile, hookah chillum and arghile [(2)].

Corresponding author:
Duaa Hamad Hamza
doaa.hamad.Hamza@gmail.com

Tobacco can be used as burning cigarettes, which affects hematological parameters and the liver enzyme activity. There are 4000 substances in a single cigarette, 200 of which are poisonous and 80 cause cancer; such poisonous substances include nitrogen oxide, nicotine, hydrogen cyanide, carbon monoxide and free radicals which result in disorders in the human body Also, smoking produces carbon monoxide that binds more firmly with hemoglobin compared to oxygen, leading to many diseases, such as blood pressure [(3)]. Smoking is an etiological agent for many chronic diseases, including a variability of infections, cancers, heart diseases, and respiratory diseases such as chronic obstructive pulmonary disease, that have weakening in the balance between cell growth and cell death, which put together, are caused of morbidity and mortality in today's society [(4)].

Materials and Methods

Subjects and study location: This study included 200 men (100 smokers and 100 non smokers,ages were ranged(25-46) years old. The current study is carried out in Al- Muthanna province. .

Blood Samples: Venous blood sample (7ml) were collected from smokers and control, 2ml from blood was placed in EDTA tube for estimation of the Haematological parameters while 5 ml from blood was placed in gel tube (free of anticoagulant) and allowed to coagulate for (15-20) minutes then centrifuged for separation of serum. for estimation of the liver enzymes .

1.Assessment of liver functions

-Assessment of GOT and GPT

GOT and GPT were determined enzymatically according to the method described by[5] , as shown in the following reaction respectably.

α – Oxoglutarate + L-aspartate

α – Oxoglutarate + L-anine

-Assessment of ALP

ALP was determined enzymatically according to the method described by[6]

-Assessment of STB

The total serum bilirubin concentration was calculated by bilirubin meter after it was calibrated using a capillary tube containing distille water. The serum samples were placed in similar capillary tubes and measured in mg /dl [7].

2. Assessment of haematological parameters

2 ml of blood samples placed in test tube containing EDTA and then mixed gently on the blood mixer, then the blood is taken by the apparatus, after that all complete blood parameters is recorded by (Sysmax-Kx-21) [8].

3. Assessment of blood pressure(Bb)

Systolic and diastolic blood pressures were measured double at 5 min intervals from the left arm after at least 15 min of rest. BP values were obtained by the traditional auscultatory method using a sphygmomanometer

Statistical Analysis

In this study , several statistical tests were used to find the significant differences among the studied parameters of smokers and control group at ($P<0.05$) level of significance. This study designed by Completely randomized design (CRD) that used in the analysis of variance for data by using one way ANOVA test, independent *t*-test and treatment means were compared using the least significant difference (LSD) at ($P<0.05$) level of significance. Data were processed and analyzed by using statistical program social science (SPSS 22) and the results were expressed as Mean±SD .

Results and Discussion

1.Liver functions

The results of this study showed GOT (23.7 ±5.1) for smokers and (13.4 ±2.1) for control(non-smokers), GPT(25.1 ±5.7) in smokers and (12.7 ±4.2) in control smokers, ALP (49.63±7.15) in smokers and (38.27 ±5.3) in control, SBT (0.69 ±0.049) in smokers and (0.70 ±0.023) in control, these results of age group (25-35) years old, while the results of age group(29-39)years old are GOT(21.5.1 ±3.4) for smokers and (14.1±1.2) for non-smokers, GPT (20.3 ±3.8) in smokers and (11.9 ±2.3) in control, ALP (60.41 ±6.04) in smokers and (43.13 ±2.0 8) in control. STB (0.60 ±0.01) in smokers and (0.58±0.01) in control, table (1)

Table (1) The change in Liver parameters of smokers group as compared with control group.

Liver parameters	Age (years)	Smokers Mean±SD	Control group Mean±SD
GOT U/L	25-35	23.7 ±5.1 *	13.4 ±2.1
	36-46	21.5.1 ±3.4 *	14.1±1.2

Cont... **Table (1) The change in Liver parameters of smokers group as compared with control group.**

GPT U/L	25-35	25.1 ±5.7 *	12.7 ±4.2
	36-46	20.3 ±3.8 *	11.9 ±2.3
ALP U/L	25-35	49.63±7.15 *	38.27 ±5.3
	36-46	60.41 ±6.04 *	43.13 ±2.0 8
STB mg/dl	25-35	0.69 ±0.049	0.70 ±0.023
	36-46	0.60 ±0.01	0.58±0.01

***represent significant difference between smokers groups as compared with control group**

The results showed a significant increase in GOT, GPT and ALP of smokers when compared to control group.This may be 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. Cigarette smoke contains a large number of chemical substances especially nicotine which is toxic to the liver [(9)].

liver enzymes increased in serum according to the damage of the liver cell, these enzymes include transferase enzymes, GOT, GPT and ALP. Alkaline phosphatase is the most frequently measured indicator for liver bile ducts disease[(10)]. GOT and GPT enzymes frequently appear in the serum following liver cell injury or sometimes in smaller amounts from degraded cells. The liver has a central and critical biochemical role in metabolism digestion detoxification and blood from intestinal tract initially passes through the liver. Elevated liver enzymes may indicate inflammation or damage to cells in the liver [(11).]

ALP is an important enzyme mainly derived from the liver and bones, but is also present in the kidneys and the leukocytes. The relationship between smoking and ALP is illustrated by inflammatory markers CRP and in particular the leukocyte count , in crease of ALP associated with smoking may reflect bone cell activity[(12).]

2.Haematological parameter

The results of this study showed total WBC (9.2 ±1.7) for smokers and (6.1 ±0.12) for non-smokers, RBC (6.27 ±0.12) in smokers and (4. 95 ±0.19) in controls, Hb (19.01 ±0.32) in smokers and (14.31 ±0.19) in control and MCV (96.87 ±4.33) in smokers and (87.29 ±2.15) in control, PLT (271.52 ±54.35) in smokers and (278.12 ±73.43) in control these results of age group (25—35) years old, while the results of age group(36-46)years old are WBC (12±2.3) for smokers and (5.3 ±1.8) for non-smokers, RBC (8.11 ±0.27) in smokers and (5.32 ±0.37) in controls. Hb (22.38 ±0.23) in smokers and (16.0 9 ±0.29) in control. MCV (117.65±4.2) in smokers and (92.33±2.01) in control, PLT (243.57 ±37.1 3) in smokers and (240± 45.81) in control, table (2)

Table (2) The change in haematological parameters of smokers groups as compared with control group.

Haematological parameters	Age (years)	Smokers group Mean±SD	Control group Mean±SD
WBC 103 /µL	25-35	9.2 ±1.7 *	6.1 ±0.12
	36-46	12±2.3 *	5.3 ±1.8

Cont... Table (2) The change in haematological parameters of smokers groups as compared with control group.

RBC 106 /µL	25-35	6.27 ±0.12 *	4. 95 ±0.19
	36-46	8.11 ±0.27 *	5.32 ±0.37
Hb g/dl	25-35	19.01 ±0.32 *	14.31 ±0.19
	36-46	22.38 ±0.23 *	16.0 9 ±0.29
MCV fL	25-35	96.87 ±4.33 *	87.29 ±2.15
	36-46	117.65±4.2*	92.33±2.01
PLT 103 /µL	25-35	271.52 ±54.35	278.12 ±73.43
	36-46	243.57 ±37.1 3	240± 45.81

***represent significant difference between smokers groups as compared with control group.**

This study agreement with the previous studies on the impact of smoking on hematological parameters, WBC, RBCs, Hb, and MCV levels were found to be markedly increased, while platelet counts were decreased. These changes have been associated with high risk of atherosclerosis, polycythemia, chronic obstructive pulmonary disease, and cardiovascular disease in smokers [13].

The results of this study indicated a significant increase at($P<0.05$) in (WBC) of smokers comparing with control, the relation of high WBC count with smoking may be due to the presence of a subclinical inflammatory reaction [14]. The leukocytosis may simply be a marker of smoking-induced tissue damage, this high count can promote cardiovascular diseases through multiple pathologic mechanisms that mediate inflammation, plug the microvasculature, induce hypercoagulability and promote infarct expansion [15]. In another suggestion that inflammatory catalyzing of the bronchial tract causes an increase in inflammatory markers in the blood circulation [16].

The present study indicated the smokers had significant increase in RBC count at ($p<0.05$) of smokers comparing with non-smokers. The increase of RBC count is termed as polycythemia and very high of RBC mass slows blood velocity and increase the risk of intravascular clotting, coronary vascular resistance decreased coronary blood flow, and a predisposition to thrombosis [17]**.** The mechanism by which polycythemia causes thrombosis is still under investigation, but smoking cigarettes creates a unique condition of combined polycythemia to chronic hypoxia, leading to elevated red cell production because of an elevated carboxyhemoglobin level with concomitant plasma volume reduction [18]. Some possible mechanisms are reported by which cigarette smoking could cause such changes in the red blood cells. Carbon monoxide, one of the chemicals identified in tobacco smoke, may induce hypoxia, usually the body responds to hypoxia by increasing the number of erythrocytes. Excessive tobacco can be result in polycythemia because this situation created a real oxy-carbon poisoning, so there was an extra oxygen demand and production of red blood cells increases to cope [19]. The result obtain in this study indicate a significant increase in hemoglobin concentrations at ($p<0.05$) compared to non-smokers. Elevated levels of hemoglobin are correlated with increased numbers or sizes of RBCs. Hemoglobin concentrations were significantly associated with increasing age in cigarette smoking men. The study was demonstrated other studies support by [20].

The results in this study show a significant increase in MCV, MCV indicates the size of a red blood cell and

presence of red cells smaller or larger than normal size means the person has anemia, elevated levels of MCV indicates that subjects might suffer from megaloblastic, hemolytic, pernicious or macrocytic anemia usually caused by iron and folic acid deficiencies [21]. The increase in hemoglobin and MCV could be due to the inhaled carbon monoxide gas (CO), which is one of the inhaled components of cigarette smoke. CO present in cigarette smoke in more than 600 times the concentration considered safe in industrial plants. A smoker's blood typically contains 4 to 15 times as much CO as that of a nonsmoker. CO combines reversibly with oxygen-carrying sites on the hemoglobin molecule by about ranging from 210 to 240 times greater than that of oxygen, which results in decreased oxygen-carrying capacity of the blood, this decrease is compensated by an increase in hemoglobin [22]. this study did not find any differences in Platelet count of smokers comparing with non-smokers, while the study conduct by [23] which found that decrease in platelet count in smokers .

3.Blood pressure

The results of this study showed that systolic blood pressure 136.72±9.67 of smoker and 121.81 ±11.0 4 of non-smoker also the results showed that diastolic blood pressure 92.51 ±5.93 of smokers and 81.0 5±6.1 8 of non-smoker these results of age group (25-35),while in age group (36-46) the results indicated that systolic blood pressure 164.31±8.71 of smoker and 130.18 ±6.25 of non smoker also the results showed that diastolic blood pressure 89.63 ±8.0 7 of smokers and 77.2 2 ±7.13 of non smoker,table 2

Table(1)The change in Blood pressure of smokers groups as compared with control group.

Blood pressure	Age (years)	Patients group Mean±SD	Control group Mean±SD
Systolic mmHg	25-35	136.72±9.67 *	121.81 ±11.0 4
	36-46	164.31±8.71 *	130.18 ±6.25
Diastolic mmHg	25-35	92.51 ±5.93 *	81.0 5±6.1 8
	36-46	89.63 ±8.0 7 *	77.2 2 ±7.13

***represent significant difference between smokers groups as compared with control group.**

The results of this study indicated a significant increase at($P<0.05$) in systolic and diastolic blood pressure in all age group may be due to harmful effects of cigaretts smoke on the vascular system, The cigarette smoking causes sympathetic activation, oxidative stress, and acute vasopressor effects that are associated with increased markers of inflammation that are linked with hypertension. There are several potential biological mechanisms through which exposure to cigarette smoke may lead to high blood pressure, cigarette smoking also increases blood pressure through stiffening arteries, particularly with deleterious effects of chronic smoking that leads to the development of hypertension. Smoking or intravenous nicotine administration increases arterial blood pressure in humans. This can be explained by an acute stimulation of the sympathetic nervous system causing heart rate increases [24].

Conclusion

There are a great side effects of cigarette smoking on liver function , haematologicl parameter (RBCs, Hb, WBCs, PLT and MCV) and blood pressure.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: None

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