Cigarette Smoking Risks on Blood Indices and Liver Enzymes of Male and Female Smokers in Kurdistan, Iraq

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Abstract

Smoking is the worst human behavior; it is practiced by people addicted to nicotine; smoking cigarettes causes many harmful diseases, such as anemia and liver sickness. The aim of the present study is to assess the relationship between gender and the effect of smoking cigarettes. For the purpose of this study, twenty-eight volunteers had participated in four different groups: Female smokers (n = 7), Female non-smokers (n = 7), Male smokers (n = 7), Male non-smokers (n = 7). The results showed that Red Blood Cells (RBCs) in Male smoker group significantly ($P < 0.05$) increased in comparison with the Female smoker group. Also, Aspartase amino transferase (AST) significantly rose in Male smoker group versus that in the Female smoker group. On the other hand, many blood indices and liver enzyme parameters in male smoker group were higher than those in the female smoker. In conclusion, cigarettes lead to a change in blood cellular and fluctuation in liver enzymatic activity in both male and female volunteers, but males were more sensitive to smoking consequences as compared with the females.

Keywords: Smoking; Blood cellular; Blood indices, Liver enzyme, Smoking Risks.

1. Introduction

Smoking is one of the basic causes of many diseases, and every 6 minutes one person dies in the world due to smoking risks (Mathers, 2006). Approximately, ten percent of the human mortality in 2012 resulted from smoking (Murray, 1997). To date, millions have died, and this rate will have reached 8 million by 2030 (Murray, 1997; Mathers, 2006). Tobacco can be used as burning as cigarettes, which affects hematological parameters and the liver enzyme activity (Khaled, 2014).

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 (Farhang, 2013). Also, smoking produces carbon monoxide that binds more firmly with hemoglobin compared to oxygen, leading to many diseases, such as blood pressure (Iqbal, 2003), anemia blood viscosity and hypoxia (Meberg, 1979; Bureau, 1983; Knottnerus, 1990; Bili, 1996) lung cancer, kidney cancer, pancreas cancer, colon cancer, liver cancer and oropharynx cancer (Fariborz, 2014), heart disease, stroke, and chronic obstacle pulmonary disease (Pankaj, 2014).

Furthermore, cigarette smoking alters the hematological system by rising in eosinophil, basophil, monocyte, lymphocyte, platelets and macrophage concentrations. It also increases haemoglobulin and RBCs in the blood (Besime, 2014). Nicotine, which is the most important among the smoking substances, stimulates hormone secretion, which leads to blood cells accumulation, an increase in blood vessel stickiness, and aggregation of platelets and blood cells (Pankaj, 2014). Additionally, it has been proven that the number of leucocytes increases according to the number of cigarettes smoked daily. The number of leukocytes decreases in the body after quitting smoking, and this is related to the period of smoking and the concentration of substances in cigarettes (Friedman, 1973; Yeung, 1984).

However, the most important diagnostic procedure to determine and evaluate liver diseases is the liver function test. Generally, it is composed of general proteins in the serum, including Albumin, Alkaline phosphate, and Bilirubin. One of these proteins is Albumin which is a negative protein that has an effect on inflammatory marker of anti-oxidants. The determination of the liver enzymes should be tested accurately, as these parameters can be affected by the environmental factors and they usually vary from one person to another (Khaled, 2014).

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Therefore, the present study focuses on the harmful consequences of tobacco on hematological parameters and serum live enzyme activity in male and female smokers.

2. Patients and Method

2.1. Case study

This investigation was conducted on twenty-eight volunteers, aged between 21 and 35 years old from Ashty hospital, Soran city. Also, their body mass index is approximately equal and all of them have similar healthy conditions.

2.2. Layout

The volunteers were divided into four groups: Group A, Female smoker (n = 7); Group B, Female non-smoker (n = 7); Group C, Male smoker (n = 7); Group D, Male non-smoker (n = 7). Data were acquired through a questionnaire that was developed for this purpose to measure many hematological parameters including the liver function test.

2.3. The Questionnaire

No.	Questions	Answer
1	Are your Smoking cigarettes currently?	Yes or no
2	Volunteer's Ages	21-35 years
3	Volunteer's Height	Cm
4	Volunteer's Weight	Kg
5	Your menstruation is normal (Females only)	

2.4. Measuring WBC, RBC HB, HCT, and MCV

On the left hand of each volunteer, a tight tourniquet was placed around his/her arm, then skin was cleaned by alcohol in median cubitalvein by venipuncture of forearm veins, 2 ml of blood were withdrawn into a syringe with all aseptic precautions in place and immediately transferred into an anticoagulant tube (K3 EDTA, Jordan), and was continuously shaken (shaker, Turkish) for a period, then WBC, RBC HB, HCT and MCV were measured by a full automated coulter count instrument (Medonic, Swedish).

2.5. Determination of Liver Function Test (LFT)

Under aseptic precautions, 3 mL of blood were taken and immediately transferred into gel tubes (Vacumed,

Italy). After standing for 30 minutes, the blood was centrifuged at 4000 rpm for 10 minutes (Hettich, Germany), then the serum was stored in Eppendorf tube at -15°C until assay of liver enzymes by auto human analyzer instrument (Bt35i, Italy)

2.6. Statistical analysis

Student T test was used to compare between the groups by using a computer based software, Statistical Package for Social Science (SPSS, version 16.0). Data were expressed as mean ± standard error of mean.

3. Results

3.1. WBC, RBC HB, HCT, and MCV of smokers and non-smokers

WBC, RBC HB, HCT and MCV were measured by full automated coulter count instrument for all volunteers smokers and non-smokers. Cigarette smoking caused a significant increase ($P < 0.05$) in RBC in males in comparison to that in females (Figure 1). Also, there was a statistical significant rise ($P = 0.000$) in HB (16.34 $\pm$ 0.394) and HCT (51.62 $\pm$ 1.503) of male smoker in concomitant with the female smokers (12.45 $\pm$ 0.548) and (38.81 +2.047), respectively. Additionally, MCV showed a statistically significant change ($P < 0.05$) between male smokers and male non-smokers (Table 1). The analysis also showed that white blood cell counts changed among all groups, but did not reach a statistical significance ($P > 0.05$) (Table 1).

### 3.2. Liver function test of smokers and non-smokers

Liver function test measured liver enzymes by an auto human analyzer instrument for all smokers and non-smokers. The AST concentration significantly ($P < 0.05$) rose in male smokers in comparison with that in female smokers, whereas there were no significant differences among the other groups (Figure 2). In addition, serum ALT(29.78 $\pm$4.853), bilirubin (0.346 $\pm$0.027) and total bilirubin (1.192 $\pm$0.144) significantly ($P <0.05$) increased in male smoker group as compared to the female smoker group (14.92 $\pm$ 2.656), (0.22 $\pm$0.043), and (0.697 $\pm$0.067), respectively; but ALP level was not statistically significant ($P > 0.05$) between male and female groups or between pair groups (Table 2) .

Table 1. Blood indices in male and female smoker

Group parameter	Female Smoker (A)	Female non smoker (B)	Male smoker (C)	Male non smoker (D)	Statistical evaluations T. test (*p*. value) A+B	A+C	C+D	B+D
WBC	7.285$\pm$ 0.631	7.257$\pm$ 0.630	9.000$\pm$ 1.263	8.157$\pm$ 0.751	0.975	0.248	0.577	0.377
HGB	12.45$\pm$ 0.548	13.44 $\pm$0.412	16.34$\pm$ 0.394	14.92$\pm$ 0.557	0.177	0.000	0.061	0.053
HCT	38.81$\pm$ 2.047	41.48$\pm$ 1.109	51.62$\pm$ 1.503	47.40$\pm$ 1.605	0.274	0.000	0.079	0.010
MCV	85.30$\pm$ 3.477	89.8857$\pm$3.7935	91.60$\pm$ 1.270	83.47$\pm$ 3.955	0.390	0.115	0.074	0.265

Table 2. Liver function test in male and female smoker

Group parameter	Female Smoker A	Female nonsmoker B	Male smoker C	Male non smoker D	Statistical evaluations T. test (p. value)			
					A+B	A+C	C+D	B+D
ALT	14.92± 2.656	12.75± 1.652	29.78± 4.853	27.40± 10.46	0.513	0.049	0.831	0.260
ALP	153.0± 15.98	195.4± 21.66	166.0± 9.055	180.3± 25.42	0.142	0.478	0.583	0.670
Bilirubin	0.22± 0.043	0.260± 0.025	0.346± 0.027	0.262± 0.026	0.437	0.028	0.050	0.954
Total Bilirubin	0.697± 0.067	0.908± 0.118	1.192± 0.144	0.885± 0.151	0.135	0.009	0.170	0.911
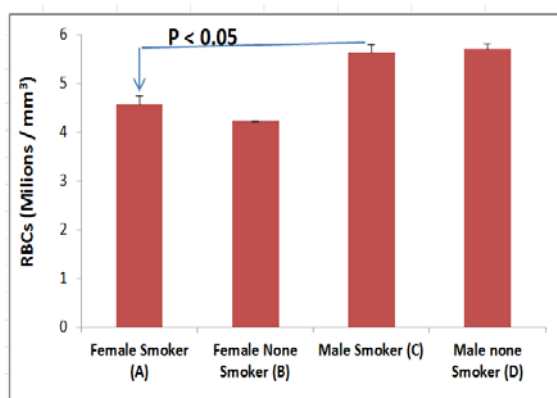
Figure 1. Red blood cell count (million / mm^3) in male and female smoker.
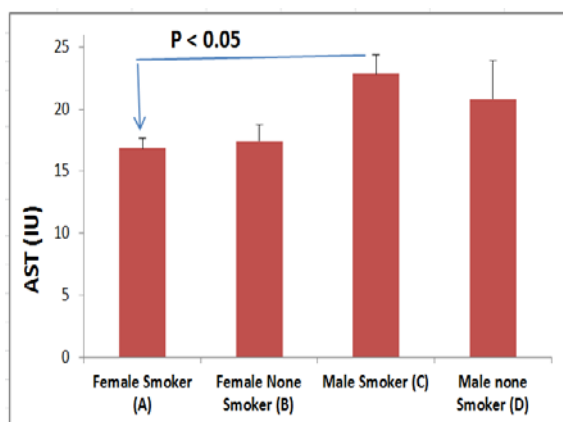
Figure 2. Serum AST concentration in male and female smoker

4. Discussion

The raising in RBC level, in the present study, was mainly due to the increase in the partial pressure of CO_2 and CO gases in the blood and led to a decrease in binding O_2 gas with the Hb, then the cells of juxtaglomerular of kidney sensed and resulted secretion erythropoietin hormone (Kaliev *et al.,* 2014), which directly contributes in RBCs production by stimulating the stem cell of the red bone marrow (Mader, 2004). But, the reason behind the high number of RBCs in male smoker group versus female smoker group (Figure 2), could be related to sex hormone differences.

Also, there was a significant ($P < 0.05$) rise in HB and Hct levels, especially in the male smoker group (Table 1).

These two parameters are highly related to RBC counts, given that HB is the concentration of haemoglobin in grams, whereas HCT is the total volume of RBCs in percentage (Barret *et al.,* 2010). Thus, if the number of red cells is increased, the HB and HCT level would increase as they proportionally change with RBCs.

However, the size of red blood cells increased in the present study due to significant ($P < 0.05$) increases in MCV of the male smoker group (Table 2). We believe that cigarettes can affect blood cellular physiology in different mechanisms, including physical and chemical interaction mechanisms.

Furthermore, smoking cigarettes caused alteration in liver enzymes, but it was more obvious in the male smoker group (Figure 2, Table 2); many of those fluctuations are related to the rise in blood indices (Stocker, 1987; Micozzi,1989; Milman, 2001). Another possible mechanism is related to male sex hormone.

In conclusion, cigarette risks lead to a change in blood cellular and fluctuation in liver enzymatic activity regardless of gender; but males were more sensitive to smoking consequences, possibly due to hormonal changes based on gender.

Acknowledgement

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