Biosciences, Biotechnology Research Asia Vol. **6**(1), 235-238 (2009)

Haematobiochemical changes in cigarette smokers

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(Received: December 25, 2008; Accepted: January 28, 2009)

ABSTRACT

Some injurious effects of cigarette smoking have been reported. It is therefore the aim of this study to look at the effects of cigarette smoking on haematological and some serum liver enzyme activities. Twenty males; aged 26 - 35 years, who smoked 10 - 15 sticks of cigarette a day for more than five years were studied. Ten apparently healthy and age-matched, non-smokers were included as control. Blood samples were taken for the analysis of haemoglobin (Hb), packed cell volume (PCV) and white blood cell counts (WBC). Also assayed were serum enzymes, aspartate transaminase (AST), alanine transaminase (ALT) and alkaline phosphatase (ALP). Cholesterol level was also determined. As compared with healthy non-smokers, cigarette smokers, exhibited significant decrease in Hb and PCV ($P<0.05$). Also observed was a decline in the number of WBC in chronic smokers. Results also showed a significant increase in the activity of AST in chronic smokers ($P<0.05$). Although, the activity of ALT was low ($P<0.05$) in chronic smokers, there was a significant increase in the activity of ALP ($P <0.05$) in these individuals. Serum total cholesterol level was high ($P<0.05$) in chronic smokers. These results support the previous suggestions that chronic cigarette smoking may increase the risk of anaemia, weak immune system and susceptibility to infections. In addition, experimental evidence indicate a measure of hepatic dysfunction and increased vulnerability to atherosclerosis among cigarette smokers.

Key words: Asparate transaminase, alanine transaminase, alkaline phosphatase, cholesterol, anaemia.

INTRODUCTION

The number of people currently smoking cigarette in Nigeria is increasing either due to economic stress or other emotional conflicts. The youth are being lured into smoking when they attend musical concerts because most of these concerts are sponsored by cigarette companies. Unfortunately, most of these companies see the African continent as a fertile ground to market their products since they are being driven away by the western countries. Pathetically, they display images of glamorous, sophisticated and successful cigarette smokers, instead of images of nervous, coughing smokers with coloured teeth and wrinkled skin, stained fingers and black lips (Igboh, 2000) Conversely, young obese persons believe that cigarette smoking will help them reduce weight since it suppresses appetite and increases the body's metabolic rate. They fail to realize that smoking predisposes people to various cancers particularly cancer of the mouth, lips, tongue, throat, oesophagus and bladder. It also leads to early wrinkle formation causing premature aging and

early death. Smoking weakens the body's immune system and is responsible for other health problems such peptic ulcer and promotes non-cancerous oral diseases that affect the gums and bones of the mouth. It contributes to loss of teeth and delays healing after dental surgery. In addition, smoking triggers allergies and may lead to sinusitis. Smokers often suffer from common cold.

Many investigators have reported the injurious effects of cigarette smoking (Plit *et al.,* 1998; Richard *et al.,* 1996; Theron *et al.,* 1994; Van der. Merwe *et al.,* 1995; Van Antwerpen *et al.,* 1995a,b,andc). It is therefore, the aim of this study to investigate the effect of cigarette smoking on same haematological and serum liver enzymes activities in southeastern, Nigeria.

MATERIAL AND METHOD

Subjects

Twenty males; age 26 - 35 years, who smoked 10 - 15 sticks of cigarette a day for more than five years were selected. Ten apparently healthy and age-matched non-smokers were enlisted as control.

Sample Collected

Samples were collected into heparimized capillary tube for analysis of haemoglobin (Hb), packed cell volume (PCV) and white blood cell (WBC) counts. About 5.0ml of blood was collected into plain, sterile tube for the assay of AST, ALT, ALP and cholesterol. Venipuncture technique was used to collect blood using 21-guage hypodermic needle and syringe. The collected whole blood was allowed to clot and then centrifuged to separate the serum which was dispensed into bijou bottle for analysis.

Analysis

For Hb, the cyanamethaemoglobin method of Fair Banks (1982) was used. While the methods of Dacie and Lewis (1991) were used for PCV and WBC counts. AST and ALT were assayed using Reitmen and Frankel (1956) method. ALP activity was determined employing Klein *et al.* (1960) method. The cholesterol level was estimated using Abell, *et al.* (1952). The statistical analysis used for haematological parameters was the one-way analysis of variance ANOVA. While, the Student's T-test was used in evaluating the activities of the enzymes and cholesterol. $P<0.05$ was regarded as significant (Obi, 1986).

RESULTS AND DISCUSSION

The values obtained are given in Table 1 and 2. Table 1 shows the changes in some haematological indices among cigarette and non-

Table 1: Effect of cigarette smoking on Haematological Parameters

Parameters	Hb (g/100ml)	PCV (%)	WBC ($X10^9$/L)
Non-smokers (10)	15.5+2.6	46.5+7.9	5.0+1.0
Smokers (20)	10.6+2.1*	31.8+6.*	3.4+0.6*

Significant difference ($P<0.05$)

Table 2: Effect of cigarette smoking on biochemical parameters

Parameters	AST (U/L)	ALT (U/L)	ALP (U/L)	Cholesterol (mg/dL)
Non-smokers (10)	10.0+1.2	7.3+1.4	44.8+2.9	150.0+2.7
Smokers (20)	19.4+2.0*	4.0+0.9*	53.5+3.5*	186.0+3.2*

*Significant difference ($P<0.05$)

cigarette smokers selected from southeastern Nigeria.

As compared with healthy non-smokers, cigarette smokers, exhibited significant decrease in Hb, PCV and WBC counts ($P<0.05$). Table 2 shows the activity values of some serum liver enzymes (AST, ALT and ALP) and cholesterol concentration in smokers and non-smokers of cigarette.

The result also showed a significant increase in the activity of AST in chronic smokers ($P < 0.05$: Table 2). Although, the activity of ALT was significantly ($p<0.05$) lower in chronic smokers, there was however, a significant increase in the activity of ALP ($P <0.05$) in these individuals. However, the total cholesterol level was higher in chronic smokers. The haematological parameters indicated a significant decline in Hb, PCV and WBC. This observation is probably due to depletion in detoxifying substances including antioxidants polyhydrocarbons such as aryllamines inhaled during smoking of cigarette smoke depletes detoxifying substances (antioxidants e.g. glutathione). These antioxidants, when depleted render the blood cells very fragile thus leading to accelerated death of the blood cells. (Plit *et al.,*1998; Richard *et al.,* 1996,Theron *et al.,* 1994; Van der. Merwe *et al.,*1995; Van Antwerpen *et al.,* 1995a,b,andc). The low Hb, PCV and WBC are indicative of destruction of the blood cells (Anderson *et al.,* 1997; Ayalogu *et al.,* 2001). Incidentally, smoking suppresses appetite and causes ulceration of the intestine. These interfere with nutrient availability and utilization by the body which may cause malnutrition, eventually manifesting as low Hb, PCV and WBC among other effects. Low Hb and PCV are also indicative of anaemia. Low WBC also denotes weak immune system and hence increased susceptibility to infections.

The elevation of AST in chronic smokers is not surprising considering that AST is elevated under conditions as in hemolytic anaemia due to destruction of red blood cells, cardiac and muscular dysfunctions. The destruction of blood cells may be one of the factors responsible for the high activity of AST in the plasma (Ayalogu *et al.,* 2001). The most significant harmful effect of smoking is coronary heart disease. Nicotine and carbon monoxide are major contributors. Nicotine stimulates the adrenal gland to release adrenaline. Adrenaline is a hormone that prepares the body to fight danger or flee from it. When a person smokes, adrenaline is released into the blood constantly. It therefore causes the production of energy to prepare the person, through mobilization of fatty acids and cholesterol. Besides increasing the heart beat, it narrows the blood vessels.

Carbon monoxide combines with haemoglobin in the blood thereby displacing oxygen and hence reducing the oxygen concentration in the blood. These factors place a great strain on the heart and increase the risk of heart disease. This can be responsible for the higher activity of AST, since AST is richly present in cardiac cells. The death of the cardiac cells will cause an increase in the activity of AST in the serum. Increased activity of AST suggests cardiac and muscular dysfunctions. It is difficult to actually explain the low activity of ALT in chronic smokers. ALP activity is significantly increased in chronic smokers. ALT and ALP play an important role n elucidation of hepatic dysfunction (Ayalogu, *et al.,* 2001) and low or high value has to be interpreted with caution because advanced cases of hepatic dysfunction could be associated with reduced activities. One may also attribute the increase in cholesterol level to the effect of nicotine present in cigarette, since it causes the release of adrenaline. Adrenaline in turn causes energy production as to prepare the person to fight or flee. And one of such stored energy utilized is fatty acids and cholesterol. The haematological and biochemical changes observed in the study, have once again demonstrated like other studies that cigarette smoking is harmful.

ACKNOWLEDGEMENTS

The authors are grateful to the management and staff of Excellence Diagnostic Laboratory, Abia, Nigeria, for their technical assistance.

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