

Original paper

Studying The Effect of Smoking on Some Blood Parameters in Young Adult Male Smokers

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Abstract

B **background:** The effect of smoking of cigarette on human health is serious and sometimes deadly.

Aim of the study was to study the effect of smoking on some hematological parameters in young adult male smokers.

Materials and methods: fifty males participated in this study, smokers (n=30) and nonsmokers (n=20). Complete Blood Cell Count was measured by Humacount 30 (fully automatic hematological analyzer).

Results and discussion: the results showed that the smokers had significantly higher levels of WBCs, RBCs, Hb, PCV and platelets count, whereas no significant difference was observed in MCV, MCH, MCHC between the two groups. This result is due to the inflammatory and irritant effects of cigarette smoking on the body organs.

In conclusion: the continuous cigarette smoking has severe adverse effects on hematological parameters and these effects may lead to increased risk of developing physiologic polycythemia, atherosclerosis and as a result cardiovascular disease.

Key words: cigarette smoking, hematological parameters, Humacount

Introduction

Tobacco is a commercial product obtained from dried and processed yellow-brown leaves collected from *Nicotiana tabacum*, the plant that is widely cultivated and grown in many countries around the world. According to data reported from the World Health organization (WHO), there is about 2.4 billion people worldwide that have consumed tobacco in the forms of smoking, chewing, snuffing or dipping. WHO also estimates that tobacco related deaths will amount to 6.4 million in 2015, 8.3 million in 2030 and one billion deaths during the 21st century⁽¹⁻³⁾. Smoking is the most important public health problem. Many studies performed have proved its deleterious effects on many organ systems mainly respiratory, and cardiovascular systems⁽⁴⁾.

Tobacco smoking is the practice of burning tobacco and inhaling the smoke

(consisting of particle and gaseous phases). (A more broad definition may include simply taking tobacco smoke into the mouth, and then releasing it, as is done by some with tobacco pipes and cigars.) The practice may have begun as early as 9000-13000 BC by the natives in Americas⁽⁵⁾

Tobacco products contain more than 50 established or identified carcinogens and these may increase risk of cancer by causing mutations that disrupt cell cycle regulation, or through their effect on the immune or endocrine systems⁽⁶⁾

Cigarette Smoking has both acute and chronic effect on hematological parameters. There are more than 4000 chemicals found in cigarette smoke⁽⁷⁾, and a cigarette smoker is exposed to a number of harmful substances including nicotine, free radicals, carbon monoxide and other gaseous products⁽⁸⁾.

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Shisha is familiar to about 1 billion people throughout the world and is daily used by more than 100 million men and women in Africa, Asia and several Mediterranean countries. The Hooka, Water Pipes, or Narghile, which are names of Shisha known in different parts of the world, had been smoked for at least 400 years⁽⁹⁾.

The active substances in tobacco, especially cigarettes, are administered by burning the leaves and inhaling the vaporised gas that results. This quickly and effectively delivers substances into the bloodstream by absorption through the alveoli in the lungs. The lungs contain some 300 million alveoli, which amounts to a surface area of over 70 m² (about the size of a tennis court). This method is not completely efficient as not all of the smoke will be inhaled, and some amount of the active substances will be lost in the process of combustion, pyrolysis⁽¹⁰⁾. Pipe and Cigar smoke are not inhaled because of its high alkalinity, which are irritating to the trachea and lungs. However, because of its higher alkalinity (pH 8.5) compared to cigarette smoke (pH 5.3), non-ionised nicotine is more readily absorbed through the mucous membranes in the mouth⁽¹¹⁾. Nicotine absorption from cigar and pipe, however, is much less than that from cigarette smoke⁽¹²⁾.

The inhaled nicotine mimics nicotinic acetylcholine which when bound to nicotinic acetylcholine receptors prevents the reuptake of acetylcholine thereby increasing that neurotransmitter in those areas of the body⁽¹³⁾. These nicotinic acetylcholine receptors are located in the central nervous system and at the nerve-muscle junction of skeletal muscles; whose activity increases heart rate, alertness,⁽¹⁴⁾ and faster reaction times⁽¹⁵⁾. During last ten years, it was suggested that cigarette smoking affect the blood characteristics as well that leads to death. For example, relation between smoking and white blood cell count has been well improved^(16,17). In other studies, it has

been found that smokers have higher white blood cell counts than nonsmokers^(18,19). Although in some earlier studies relationship between smoking and red blood cell was found in smokers⁽²⁰⁾.

Other study showed that smoking affected white blood cell count and von Willebrand factor levels in males and not in females, and as such could be potential markers for smoking-induced endothelial damage in asymptomatic Arab male smokers⁽²¹⁾.

Also in other research, Highly significant differences were observed in whole blood viscosity at all the shear rates measured, plasma viscosity, plasma fibrinogen concentrations, packed cell volume, and carboxyhaemoglobin concentrations⁽²²⁾.

Smoking cessation studies have demonstrated that some of these changes are reversible, and transitory in case of cessation of smoking⁽¹⁰⁾.

Materials and methods

The study was conducted in the college of applied medical sciences, university of Karbala from September 2014 to November 2014. 30 adult healthy males smokers as smoker group and 20 adult healthy males non-smokers as control group were included in this study. The two group age was ranged from 18-24 years. The collection of (2 ml) of blood was done by disposable sterilized plastic syringe, Needles used were 21 gauge. The arm should be warm to improve blood circulation and distended the vein. A tourniquet was applied directly on the skin around the arm (usually from the left arm), approximately (6-8cm) above the site of collection and its directly removed just the blood drawn into syringe. The skin over the vein was sterilized with a small pad of cotton wool soaked with 70% ethyl alcohol, and the site was dried with clean gauze and then the blood was put into tubes contain disodium ethylene diamine tetra acetic acid (EDTA) as anticoagulants

to prevent clotting of blood to be used for hematological studies which include RBC(Red Blood Cell) count, Hb (Hemoglobin) concentration, PCV(Packed Cell Volume), WBC (White Blood Cell) count, platelets count, MCV(Mean corpuscular volume), MCH(Mean corpuscular hemoglobin) and MCHC(Mean corpuscular hemoglobin concentration). The hematological parameters were measured by Humacount 30 (fully automatic hematological analyzer). The data were entered into the computer and analyzed by using the Statistical Package for Social Sciences (SPSS for Windows, version 20.0). Unpaired t-test (parametric test) was applied to test the difference of the means between the two quantitative variables. The level of significance was assumed at $p < 0.05$.

Table 1. Hematological parameters between smokers and non-smokers groups

Parameter	Smokers Mean± S.D	Non-smokers Mean± S.D	P.value
R.B.C. Count (millions/cu.mm)	5.8170± .94584	5.2674± .31719	P<0.005
Hb concen. (g/dl)	15.530± .9148	14.974± .6100	P<0.05
PCV(Hematocrit) (%)	52.5922± 7.66074	46.7789± 2.65435	P<0.005
W.B.C.Count (cell x 10 ³ /mm ³)	9.8004± 2.85484	7.3300± 1.14656	P<0.0001
Platelets Count (cellx10 ³ /mm ³)	351.41±39.576	341.37±61.675	P<0.05
M.C.V. (fl)	92.85 ±2.568	88.05 ±4.020	P>0.05
M.C.H. (pg)	29.285±1.3286	28.842±1.3040	P>0.05
M.C.H.C. (g/dl)	31.881±0.8762	31.542±1.1281	P>0.05

Discussion

Tobacco smoking has been correlated to cause several major hematological, biochemical and pathological problems⁽²¹⁾.

The results showed significant differences in hematological parameters like; WBC count, RBC count, Hb concentration, PCV and platelets count were significantly high in smokers group as compared to non-smokers group. Whereas we did not find any significant difference in MCV, MCH and MCHC

In this study we observed that hemoglobin and PCV values were significantly high in smokers than in non-smokers ($P<0.05$) ($p<0.005$) respectively. Increased in levels of hemoglobin and

Results

The mean age of smoker group was (20.67 ± 1.177) years, and for non-smokers group was (20.53 ± 1.172) year, and the two results show no significant difference between them ($p>0.05$). Also, the mean duration of smoking in smokers group was 3.74 ± 1.228 years (range 1-6 years).

Smokers group showed a statistically significant increase in the mean values of RBC count ($P<0.005$), Hb concentration ($P<0.05$), PCV (Hematocrit) ($P<0.005$), WBC count ($P<0.0001$) and platelets count ($P<0.05$), whereas there was no significant difference was observed in MCV, MCH, MCHC between the two groups ($P>0.05$) (table1).

PCV concentration are related with increased numbers or sizes of RBCs. RBC count were significantly high in smokers than in non-smokers ($P<0.005$) and is *in* agreement with the results of other investigations^(20,23). Also, *the* combination of CO in tobacco with effects of nicotine disrupts oxygen delivery to tissue and stimulates the bone marrow to produce more RBCs and thereby increase HCT and Hb⁽²⁴⁾.

Concomitant^{ly} that, Hb concentration increase in smokers because the inhaled carbon monoxide result in increased carboxy hemoglobin ,which has no oxygen carrying capacity .impaired tissue oxygen supply results from decrease oxygen carrying capacity and increase

oxygen-hemoglobin affinity caused by carboxy hemoglobin (COHb), to compensate, Hb level increase⁽²⁵⁾. Smoking is also considered as a major cause of polycythemia and elevated hematocrit levels⁽²⁶⁾.

The increase in WBC count is related with The Inflammatory stimulation of the bronchial tract induces an increase in inflammatory markers in the blood^(27,28). Chronic tissue damage caused by nicotine may be a possible mechanism for the increased total leucocyte count smokers⁽²⁹⁾.

Also, Prolonged smoking impairs ciliary movements, causes hypertrophy and hyperplasia of mucus secreting glands, hyper responsiveness of the airways and causes bronchiolar inflammation⁽³⁰⁾.

Elevation of platelets counts in smokers indicates that these blood components may have an early role in the pathogenesis of arteriosclerosis⁽³¹⁾. It has been proposed that fibrinogen links platelets receptors, which are preconditions for platelets aggregation and also promote hypercoagulable state as well as causing endothelial damage, disorganization and dysfunction⁽³¹⁾.

The increased cardiovascular morbidity and mortality among cigarette smokers is also mediated in part by enhanced platelets reactivity and activation⁽³²⁾.

However, strong correlation has been found between cigarette smoking and atherosclerosis and cardiovascular disease⁽³³⁾. Potential mechanisms for smoking induced damage include increased Plt reactivity and agreeability⁽³³⁾.

MCV, MCH and MCHC are three main red blood cell indices that help in measuring the average size and hemoglobin composition of the red blood cells. Their values are derived from the Hb, HCT and RBC-count by mathematical calculations; $MCV = [HCT (\%) \times 10 / RBC (\text{million/cmm})] \text{ fL}$; $MCH = [Hb (\text{g/dL}) / RBC (\text{million/cmm})] \text{ pg}$ and $MCHC = [Hb (\text{g/dL}) / HCT (\%)] \text{ g/dL}$ ⁽³⁴⁾.

The results of the three main red blood cell indices (MCV, MCH, MCHC) show no significant difference in three values and this is *in* agreement with results of other study⁽³⁵⁾.

Conclusion

This study suggested that many blood parameters like RBC, PCV, Platelets count may be a good early indicator for developing a cardiovascular disease in smokers. Because, these cells make the smokers blood more viscous so the blood does not flow efficiently and lead to formation of clots.

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