



Smoking Effects of Marijuana and Cigarette on Blood Chemistry, Hematology and Plasma Dopamine Levels in Young Adults

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Authors' contributions

This work was carried out in collaboration between all authors. Author OATE designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author CEU performed the statistical analyses and managed the literatures and author OTA carried out a part of the study and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: Smoking is an increasing problem in public health world-wide. Smoke from marijuana and cigarette have been shown to contain many toxins. This study investigated the effect of marijuana and cigarette smoking on hematology, blood chemistry and plasma dopamine level of smokers in comparison to non-smokers.

Materials and Methods: Blood samples were taken from thirty randomly selected Nigerian male and female non-smokers (control) and thirty smokers each. Analytical biochemical procedures and standard Randox diagnostic kits were used to determine the blood chemistry, hematology, electrolytes and plasma dopamine level of smokers and non-smokers.

Results: The completely randomized design study revealed no significant ($p>0.05$) difference in the blood chemistry, hematological parameters, electrolytes and plasma dopamine levels between the test and control subjects. Though within normal range, the values observed for total leucocytes were marginally higher in the cigarette smoking test subjects, while marginally lower in marijuana smoking

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test subjects when compared to the control (non-smokers). PCV and hemoglobin were marginally higher in all the test subject. Dopamine levels were marginally higher in all test subjects when compared to control.

Conclusion: This study showed that smoking of cigarette and marijuana marginally effected hemoglobin, PCV, leukocyte count and dopamine. The marginally lower leucocytes in marijuana smoking test subjects is an indication that cannabinoid, the psychoactive substance contained in marijuana, may reduce immune responses in marijuana users.

Keywords: Marijuana; cigarette; blood chemistry; hematology; electrolytes; dopamine; humans.

1. INTRODUCTION

There are chemicals in cigarettes and marijuana which makes smoking them harmful to health and can lead to death [1]. Delta-9-tetrahydrocannabinol (THC) is the active ingredient in cannabinoid found in marijuana [2]. THC has some therapeutic effect which includes alleviating nausea and vomiting, but smoking of marijuana could lead to dizziness, tachycardia tremor, transient muscular rigidity and disoriented [3]. Marijuana smoking have been reported to significantly affect the blood chemistry and may also affect neural functions [4].

Cigarette smoking is the most common type of tobacco used and it's a major cause of preventable death [5]. One of the main constituent of tobacco nicotine, smoking it increases the deposition of LDL cholesterol in the arterial wall and it's a risk factor for coronary and cerebral atherosclerotic vascular disease [6].

On interacting with smokers it was discovered that there was an increase in smoking by young Nigerians, and this could be as a result of the current economic condition and peer pressure. The effect of cigarette, marijuana and a combination of the two on blood parameters in smokers will be investigated in this study, to analyze possible deviations from the non smokers.

2. MATERIALS AND METHODS

A random selection of thirty (25-30 years) adult Nigerian marijuana, cigarette and a combination marijuana and cigarette smokers, and 30 non smokers each, were recruited for this study. The smokers were regular smokers of cigarette at least 2 packets of Benson and Hedges daily. All volunteers gave their written consent. The non-smokers or controls have never smoke cigarette.

Five millilitres of venous blood were collected with needles and syringes from ten healthy

smokers of marijuana, ten healthy smokers of cigarette, and ten healthy smokers of a combination of marijuana and cigarette and thirty healthy non-smokers of the same age group, in lithium heparin bottle for the blood chemistry and dopamine analysis and also into Ethylene diamine tetra acetic acid (EDTA) bottles for the hematology analysis.

The plasma dopamine level was assayed by High Performance Liquid Chromatography [4], while the electrolytes levels determined flame photometry [6]. The lipid profile was determined using diagnostic Randox kits and hematology by auto-analyzer [7].

2.1 Statistical Analysis

Data of the study obtained were subjected to analysis of variance (ANOVA) using the General linear model. The SPSS v25.0 computer software package Inc Chicago, USA and Graphpad Prism 7.0 were used for the study. The results are presented as mean±SEM and determination of P value by ANOVA for comparison between means with level of significance were assessed at 5% confidence interval.

3. RESULT S

The results of plasma lipid profile of marijuana and cigarette smokers and non smokers were presented in Fig. 1. There was no significant difference ($p>0.01$) in the levels of plasma cholesterol, HDL and triacylglycerol of marijuana, cigarette, marijuana, marijuana –cigarette smokers and non smokers.

There was also no significant difference ($p>0.01$) in the hematological profiles of the marijuana, cigarette, marijuana cigarette smokers and non-smokers (Fig. 2). There was no significant difference ($p>0.01$) in the levels of PCV, WBC and Hb of marijuana, cigarette, marijuana –cigarette smokers and non smokers.

The results of the plasma electrolyte levels of marijuana, cigarette, marijuana-cigarette smokers and non-smokers showed no significant difference as compared to the control (Fig. 3). There was no significant difference ($p > 0.01$) in the levels of sodium and potassium ions of marijuana, cigarette, marijuana –cigarette smokers and non smokers.

The plasma dopamine level of the control was significantly higher than in the marijuana, cigarette and cigarette – marijuana smokers. There was significance ($p < 0.01$) difference in the plasma dopamine levels of the marijuana , cigarette, marijuana –cigarette as compared to the control (Fig. 4).

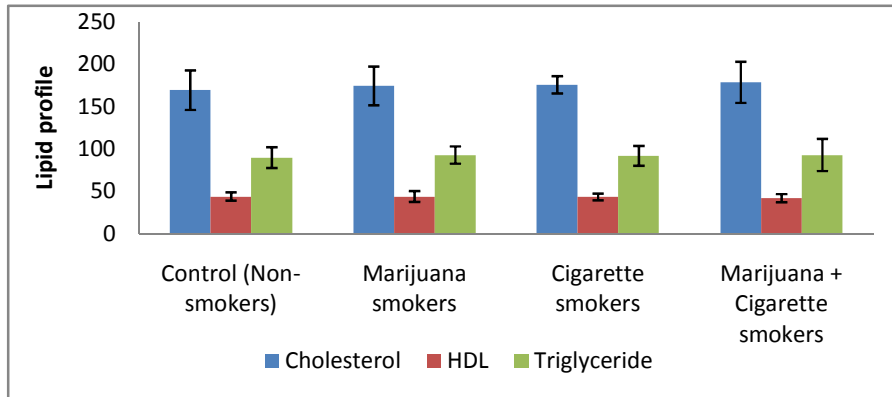


Fig. 1. Plasma lipid profile of marijuana and cigarette smokers and non-smokers

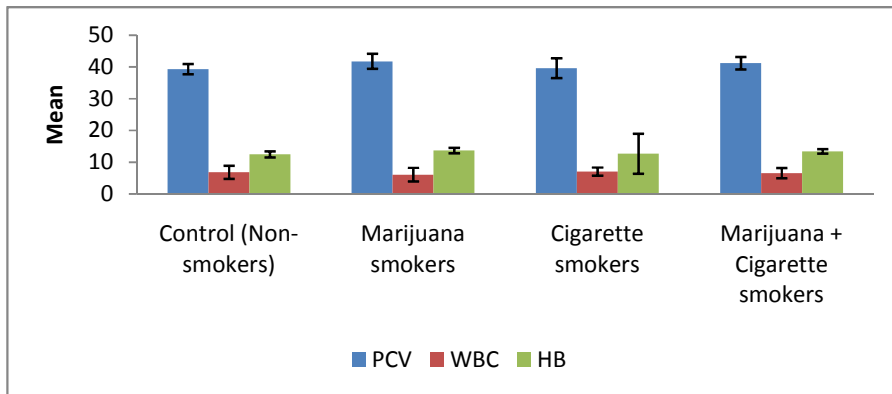


Fig. 2. Plasma hematological profiles of marijuana and cigarette smokers and non-smokers

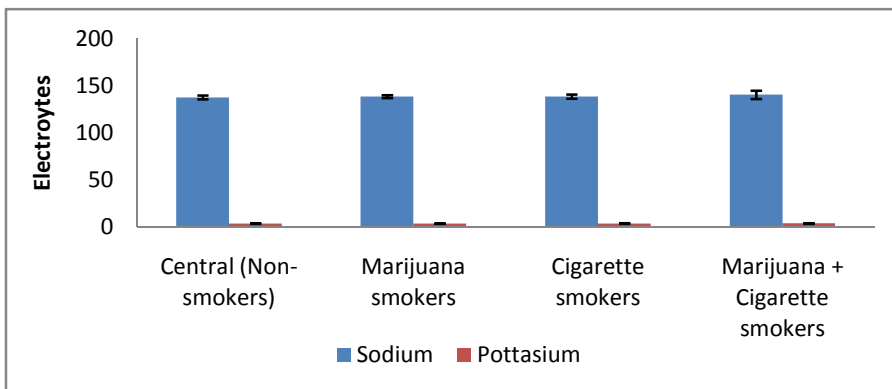


Fig. 3. Plasma electrolytes levels of marijuana and cigarette smokers and non-smokers

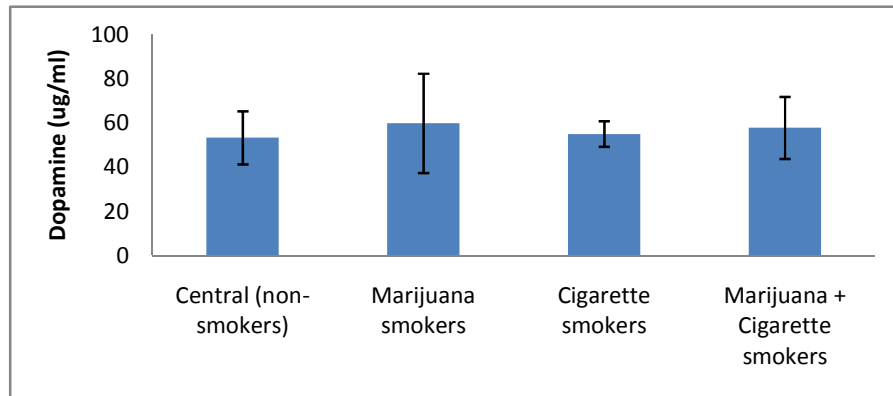


Fig. 4. Plasma dopamine levels of marijuana and cigarette smokers and non-smokers.

4. DISCUSSION

This study investigated the effect of marijuana and cigarette smoking on blood chemistry, hematology, electrolyte and dopamine characteristics of smokers in comparison to non-smokers. The completely randomized design study revealed no significant ($p > 0.05$) difference in the lipid profile, hematological parameters, electrolyte and dopamine levels between the test and control subjects.

Dopamine levels were significantly higher in all marijuana, cigarette and marijuana- cigarette smokers when compared to control. This may be due to the active constituents, especially cannabinoids increase dopamine neural firing by decreasing GABAergic inhibition of dopamine neural activity [8]. The marginal reduction of HDL cholesterol, though not significant, in the marijuana smokers than in control, is in agreement with the previous results of Muniyappa et al. [9].

Though within normal range, the values observed for total WBC were marginally higher in the cigarette smoking test subjects, while marginally lower in marijuana smoking test subjects when compared to the control (non-smokers). This could be as a result of the accumulated active ingredient, cannabinoid inhibiting both T and B-lymphocytes through blocking of amino acid uptake into the stimulated lymphocytes [10]. PCV was marginally higher in test subjects than in control, this could be as a result of reduction in quantity of oxygen available to the tissues as a result of smoking. This is in agreement with the findings of Nwaichi and Omorodion [10]. Hemoglobin was marginally lower in test subjects than in control, this may be

as a result of reduced iron group of heme due to reduced oxygen – carrying pigment [11].

Marijuana has some well proven benefits, including relief for long term pain. But smoking marijuana can have some bad effects on your health, including making breathing problems worse. The federal ban on marijuana makes it hard to study its effects on humans. For example, very little research exists on edible marijuana [12,13]. Recent studies have shown that there is decreased dopamine brain reactivity in marijuana abusers, which associated with negative emotionality and addiction severity [14].

Marijuana can increase brain and plasma dopamine levels. Dopamine is a brain chemical that makes you feel rewarded. Its responsible for the pleasure you feel when eating, having sex or using drugs [15,16,17]. The cannabinoids in marijuana do not act on dopamine neurons directly. Instead, they act on the endocannabinoids system. Cannabinoid receptors are found in many brain areas that have dopamine neurons [18].

5. CONCLUSION

This study showed that smoking of cigarette and marijuana marginally effected hemoglobin, PCV, leukocyte count, HDL cholesterol, but significantly elevated plasma dopamine level as compared to non smokers. The marginally lower WBC in marijuana smoking test subjects is an indication that cannabinoid, could reduce immune responses in marijuana users. The marginal reduction in HDL cholesterol level in marijuana smokers may lead to an increase in the risk of heart diseases.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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