

Assessment of Serum Copper and Lead in Sudanese Cigarette Smoker

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ABSTRACT :

Objective: the objective of this study is to determine the concentration of serum copper and lead in Sudanese smokers.

Material and Method: This case control study was carried out, 50 smokers males (aged 18-45 years old), and 50 non smokers males (aged 18-45 years old, as control) were enrolled. Three ml of venous blood were collected from each volunteer. Serum copper and lead were estimated using atomic absorption Spectrophotometer.

Results: The of (mean \pm SD) lead and copper in male person respectively were (1.10 \pm .496, .70 \pm .29) while the (mean \pm SD) of lead and copper in non smoker respectively were (.002 \pm .001, .92 \pm .22). Serum lead was significantly increase in smokers compared to non smokers. A positive correlation found between serum Lead and the number of cigarettes per day and duration of smoking. Serum copper was significantly decrease in smokers compared to non smokers.. Serum copper and lead did not change due to age difference. There was a weak Negative correlation found between Copper level and the number of cigarettes per day and duration of smoking.

Conclusion: A significant increased of serum lead and decreased of serum copper is detected in cigarette smokers in Sudan, whereas it is not affected by age differences, but affected by number of cigarettes, and duration of smoking .

Keywords: Cigarette smoking, serum copper, serum Lead, Sudanese.

INTRODUCTION:

Smoking is a practice in which a substance, most commonly tobacco or cannabis is burned and the smoke tasted or inhaled. The most common method of smoking today is through cigarette⁽¹⁾. Tobacco use leads most commonly to diseases affecting the heart and lungs, with smoking being a major risk factor for heart attacks, strokes, chronic obstructive pulmonary disease (COPD), emphysema, and cancer. It also causes peripheral vascular disease and hypertension, all developed due to the exposure time and the level of dosage of tobacco⁽²⁾. Minerals is very essential substances involved as catalysts in most cellular enzymatic reactions and assume a major role in metabo-

lism⁽³⁾. Copper is example of these essential minerals. Functions of copper participates in many biochemical processes including cellular respiration, cellular utilization of oxygen, maintenance of all cell membrane integrity, and sequestration of free radicals⁽⁴⁾.

Lead is one of the toxic elements that have known to biological functions. The main target for lead toxicity is the nervous system, function and exposure to these elements could result in either immediate or delayed adverse health effects⁽⁵⁾. Literature survey showed that no sufficient work has been done to study the effect of cigarette smoking on serum minerals alterations, so this study was carried out to determine the influence

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of cigarette smoking on serum copper and lead levels among Sudanese smokers and to determine the relationship between the levels of serum copper and lead with age, number of cigarettes per day, and duration of smoking. Cigarette smoke contains thousands of chemicals that cause several disorders, including cardiovascular disease, cancer and chronic obstructive pulmonary disease⁽⁶⁾. Free radical-mediated processes have been implicated in cigarette related diseases. Free radical in cigarette smoke may cause oxidative damage to macromolecules, contributing to cardiovascular disease and cancer⁽⁷⁾⁽⁸⁾. Long-term exposure to lead can cause nephropathy, and colic-like abdominal pains, It also causes small increases in blood pressure, severely damage the brain and kidneys in adults and ultimately cause death. Chronic, high-level exposures have shown to reduce fertility in males⁽⁹⁾ the objective of this study to determine the effect of smoking on serum copper and lead.

MATERIAL AND METHODS:

Hundred male volunteers were enrolled in this study. During the period of November 2014 -February 2015; of those fifty volunteers were cigarette smokers age ranged (18 -45) years old, and fifty were non smokers age ranged (18-45) years old, as control group. They were study population in Khartoum state. Both groups were without history of alcohol consumption, chronic diseases, and snuffer user. Volunteers were enrolled in the study after being fully informed about the aims of the study. In addition, written consents had been obtained. And the results of analysis (lead and copper levels) were offered free of charge for all of them.

The history included information about the volunteers obtained from them according to the designed study questionnaire. (The form induced the importance of the research, and we informed the participant that there is no hazard for them and the data gained will not be used for any study except the current study)

Sample collection

Under a septic condition, about 3ml of venous blood were collected from each volunteer by venipuncture technique and were placed in anticoagulant free containers, and allowed to clot then centrifuged at 3000 rpm for 5 minutes to obtain serum which kept in eppendorf tubes for measurements of copper and lead. Serum copper and lead were measured by using Atomic Absorption Spectrophotometer method.

Statistical Analysis:

Statistical evaluation was performed using the Microsoft Office Excel (Microsoft Office Excel for windows; 2007) and SPSS (SPSS for windows version 19). Normal distribution of the studied variables was examined using t-tests. Unpaired T-test and Mann-Whit-

ney U test were used to assess significant difference in the means of the studied variables in patients and control.

Variable	Study group		P.value
	Smokers	Control	
Age (years)	25±6.9	25.0±6.3	0.46
Cu (M ± SD mg/L)	0.70±.29	0.92±.22	0.000
Pb (M ± SD mg/L)	1.10±.496	0.002±.001	0.000

Table 1: Mean and standard deviation of age and copper and lead in study population.

Correlation analysis revealed significant correlation between the serum copper and number of cigarette per day ($r= -0.3$, $p=0.07$) and smoking duration ($r=-0.3$, $p=0.031$).

Correlation analysis revealed significant correlation between the serum Lead and number of cigarette per day ($r=.3^*$, $p=0.014$) and smoking duration ($r=.3^*$, $p=0.034$).

DISCUSSION:

Cigarette smoking is a worldwide major cause of preventable morbidity and mortality⁽¹⁰⁾ Copper is an essential trace metal that plays an integral role in many of our physiologic processes, including acting as a ligand to many proteins and enzymes. It is crucial in the structure of dopamine β -hydroxylase, the enzyme responsible for conversion of dopamine to nor epinephrine, which mediates many neurologic functions. In addition, copper helps form cytochrome oxidase, a component in oxidative phosphorylation, and superoxide dismutase, an antioxidant. Copper also acts as a ligand to peroxidase II⁽¹¹⁾ Also Lead is a highly poisonous metal that has known to biological functions, affecting almost every organ and system in the body, this study involved male volunteers rather than female because it is so difficult to find smoker females as smoking is a harmful for them in our society, although it appears to increase in recent days. Also the study participants were youth as the smoking become more spread among this age group. In the present study a total of hundred volunteers were enrolled; fifty were smokers; age ranging between 18 and 45 years. And fifty were non smokers; age ranging between 18 and 45 years. This study showed that serum copper was significantly decreased in smokers when compared to non smokers (p value 0.000), this result is in agreement with previous study⁽¹²⁾, and some researchers' have indicated that smokers have significant higher serum copper, as compared to non-smokers^(13, 14) as smoking causes copper deficiency can produce

anemia-like symptoms, neutropenia, bone abnormalities, hypo pigmentation, impaired growth, increased incidence of infections, osteoporosis, hyperthyroidism, and abnormalities in glucose and cholesterol metabolism⁽¹⁵⁾. The study revealed that serum lead was significantly increased in smokers when compared to non smokers (p value 0.000). This result is in agreement with a previous study⁽¹⁶⁾; as Cigarette smoking can increase lead due to is rapidly absorbed into the bloodstream and is believed to have adverse effects on the central nervous system, the cardiovascular system, kidneys, and the immune system, Exposure to high lead levels can severely damage the brain in adults and ultimately cause death. Chronic, high-level exposures have shown to reduce fertility in males.⁽¹⁷⁾

CONCLUSION:

A significant increase of serum lead and decreased of serum copper in cigarette smokers in Sudan was observed, whereas the level is not affected by age differences, but affected by number of cigarettes, and duration of smoking. Educational programs are necessary to increase people awareness about serious health effects of smoking.

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