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STUDY OF EFFECT OF SMOKING ON SERUM CALCIUM LEVELS IN HEALTHY MALE INDIVIDUALS

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ABSTRACT:

Objective: Smoking is an important determinant of numerous diseases. Electrolytes and minerals are involved in most cellular activities and assume a major role in metabolism. Smokers are at greater risk for cardiovascular diseases, respiratory disorders, cancer, peptic ulcers and gastroesophageal reflux disease, blindness, bone matrix loss, and hepatotoxicity. The present study is aimed to understand the influence of electrolyte alterations on serum lipid profile and enzymes in chronic cigarette smokers.

Materials and Methods: This is a cross-sectional study done on thirty human male volunteers in each group, aged between 30 and 50 years taking local diet and smoking for 5–10 years at least 6-12 cigarettes per day were chosen as experimental subjects. Controls (age and sex matched) who did not smoke were selected for the study. Blood samples drawn from human volunteers by venipuncture and were used immediately for analysis of serum calcium levels.

Results: After the Statistical analysis it was found that there was a significant increased level of serum calcium was observed in smokers.

Interpretation & Conclusion: Our study shows that chronic cigarette smoking alters serum calcium level. chronic cigarette smoking might have induced alterations in membrane permeability properties of tissues and organs, which might have resulted in changes in signal transduction and electrolyte imbalance.

INTRODUCTION

- World wide more than 3 million people currently die each year from smoking, half of them before the age of 70, an enormous human cost, and more than one third have cardiovascular events that often determine permanent disability of affected subjects[XI]. Apart from Tar cigarette smoke contain many harmful carcinogenic constituents, including metals, PAHs, dioxins, and some non -volatile nitrosamines. Smokers are at greater risk for cardiovascular diseases, respiratory disorders, cancer, peptic ulcers and gastroesophageal reflux disease, blindness, bone matrix loss, and hepatotoxicity[I]. Cigarette smoking has been identified as a risk factor for low bone mineral density and osteoporotic fracture. There are wide variety of mechanisms by

which smoking induces bone toxic effects. A decrease in intestinal calcium absorption, low body weight and earlier menopausal age have been described. There is also a direct toxic effect on bone and alterations in blood supply of the femoral head. However, the most prominent mechanism seems to be their action on estrogen metabolism.Smoking decreases the estradiol level. Estradiol favors the retention and elevation of calcium as well as phosphorous and skeletal deposition of calcium as a result of calcification and ossification of bones. Estradiol prevents osteoporosis which is frequently seen in menopausal women when estrogen decreases. In addition, smoking has been associated with vitamin D metabolism derangement[VII]. The present study was conducted to determine the calcium level in the serum of cigarette smokers and non-smokers.Electrolyte disturbances may lead to severe and even life-threatening metabolic abnormalities such as coronary heart disease, liver disease, lungs infection, kidney failure, disordersof endocrine system. Hence, the present study is aimed to understand the influence of electrolyte alterations on serum lipid profile and enzymes in chronic cigarette smokers.

MATERIALS AND METHODS

- This was a cross-sectional study was conducted in which 60 volunteers between the age group of 30-45 years were included. They were divided in 2 groups. 30 male subjects who were smokers with history of smoking for at least 5-10 years and smoking minimum 6-12 cigarettes per day were taken as cases and 30 nonsmokers volunteers with age and sex matched were taken as controls. Any volunteer with history of any illness or evidence of any disease that may affect bone and mineral metabolism, particularly chronic renal failure, chronic liver disease, malabsorption, and endocrine disorders and use of any drugs which can affect the electrolyte level were excluded from the study. All the volunteers were well informed about the experimentation and their written consent was obtained. Blood samples from overnight fasted subjects were used for the study. Blood samples drawn from human volunteers by venipuncture and were used immediately for analysis. Detection of serum calcium was done by automated analyzer in High-Tech Lab of Civil Hospital, Ahmedabad. Data were subjected to statistical analyses, values are means ± S.D. of 30 subjects in each group. Two-sided paired Student's *t-test was performed for finding significant difference* between the groups. *$p < 0.05$ was considered* statistically significant.

RESULTS

Variable	Case (n=30)	Controls (n=30)	P value
Age	45.35±17.890	43.00±18.036	0.517
BMI	23.10±1.55	22.32±1.76	0.508
Pulse rate	81.5±10.2	80.6±9.8	0.62
SBP	140.7±4.3	136.1± 4.4	P<0.05*
DBP	75.8±6.1	75.2±5.8	0.42
Serum Calcium (mg/dl)	9.63± 0.32	7.71 ± 0.27	P<0.05*

Above table shows comparison of different variables and serum calcium levels among both groups. It suggests that mean age of case group was 45.35±17.890 and in control group mean age was 43.00±18.036,and the difference is not significant. From table it is also evident that BMI of smokers was slightly higher than non-smokers but again the difference was not significant. Among the vital parameters significant difference was found only in systolic blood pressure which was 140.7±4.3 in case group and 136.1± 4.4 in control group. While pulse rate and diastolic blood pressure do not show significant difference. Serum calcium was 9.63± 0.32 in smokers and 7.71 ± 0.27 in non smokers which suggests smokers have significant higher serum calcium level as compared to non-smokers.

DISCUSSION

Cigarette smoking is a world-wide major cause of preventable morbidity and mortality[VI,VIII,V].Cigarette smoke consists of many chemicals, including nicotine, tar with its many carcinogens,
and gaseous compounds including carbon monoxide (CO)[IV,II]. CO was shown to accumulated in the human body with repeated smoking. Chronic exposure to low levels of CO results in tissue hypoxia. Hypoxia represents a stress that induces cell growth arrest and injury, probably as a result of decreased blood oxygen carrying capacity[XII]. Increased carboxyhemoglobin and decreased oxyhemoglobin might have resulted in respiratory acidosis and electrolyte imbalance. It has since long been known that blood pressure and heart rate increase during smoking. These effects are specifically associated with nicotine while the other components of which more than a thousand have been isolated seem to be of minor importance. The rise in blood pressure is due both to an increase in cardiac output and total peripheral vascular resistance. Increase in serum calcium levels of chronic cigarette smokers are correlated with increase in plasma lipid profile. Increase in calcium concentration was negatively correlated with serum HDLcholesterol and positively correlated with LDLcholesterol. HDL may be involved in the modulation of calcium channels and its decrease might have increased the concentrations of calcium in the plasma of chronic cigarette smokers[IX]. Serum calcium may be an independent risk factor for myocardial infarction in middle-aged men followed for 18 years[X]. Cigarette smokers are susceptible to coronary heart diseases. It has been reported that the severity of coronary atherosclerosis is closely related to coronary artery calcification, which itself may correlate with serum calcium and phosphorus concentrations. Similar results were also found in study done by A. Supervía, X. Nogués, A. Enjuanes, J. Vila, L. Mellibovsky, S. Serrano, J. Aubía, A. Díez-Pérez[XIII] we found a significant differences in between serum calcium, serum

phosphate and serum alkaline Phosphatases level. Brot C, Jorgensen NR, Sorensen OH[III] also found the same relation between serum calcium level and smoking.

CONCLUSION:

This was a comparative cross-sectional study done in the general population of Ahmedabad district where 30 smokers and 30 non smokers healthy volunteers were compared for serum calcium levels. Although our study does suggest higher serum calcium levels in smokers but it is not applicable to general population because of smaller sample size and also not taking into consideration other factors such as Vitamin D level, serum PTH level, Serum estrogen level etc. which may affect calcium metabolism. So, further research is needed in this regard.

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