SERUM CALCIUM, PHOSPHATE AND ALKALINE PHOSPHATASE IN CIGGRETTE SMOKERS IN KHARTOUM STATE

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Abstract

Key words : Smokers, Sudan ,alkaline phosphatase, cigerttes ,osteoporoses

Smoking is the most significant risk factor for health according to WHO statements. Tobacco smoking is an important risk factor for the development of several cancers, osteoporosis, and inflammatory diseases**.** This study aims to evaluate the effect of smoking on serum calcium; phosphate and alkaline phosphate activity In addition to correlated the estimated parameters with onset of smoking and numbers of cigarettes smoked per day. . Apparently healthy hundred cigarette smokers with mean age(32.13 ±1.54) years Body mass index (24.82)with average cigarettes smoking per day (11.36 ±8.4) and have mean history of smoking (12 ±11.37)were defined as case .While hundred copartners healthy nonsmokers with mean age(31.24 ±1.02) years and body mass index (25.02) were nominated as control. At P ≤0.05 this study showed significant difference in Alkaline phosphatase(ALP) between smokers(167.38 ± 84.9) and nonsmokers (107.96 ±38.07) P value was 00.While there were significant differences in serum calcium and phosphorus for smokers (7.56 ±1.38, 7.56 ±1.38) and nonsmokers(7.71 ±1.00, 4.51 ±1.17),with P value 0.05 for both. revealed positive correlation between age and

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Alkaline phosphatase(ALP) phosphate ,numbers of cigarettes per day and duration of smoking correlation coefficients(0.36, 0.08, 0.298).Duration of smoking showed high significant positive correlation with numbers of cigarettes smoked (0.663) positive weak correlation with ALP (0.189) and negative correlation with serum calcium and phosphorus(-0.11, -0.30).Serum phosphorus level showed significant positive correlation with Calcium (0.295) and ALP(0.065) .While, serum calcium level showed negative correlation with ALP(-0.154). Serum calcium is slightly reduced in cigarette smokers and it correlated positively with duration and number of cigarette smoked per day.

Introduction

Tobacco smoking is most prevalent and preventable cause of disease and death (Wan-Kuen, *et al.*, 2003&Parrottand Winder 1998). Worldwide more than 3 million people currently die each year from smoking, half of them be-fore the age of 70, an enormous human cost, and more than one third have cardiovascular events that often determine permanent disability of affected subjects. There are more than one billion smokers in the world with an increased/decreased/again in-creased smoking habit (Aurelio, 2005).

Recent studies have shown a direct relationship between tobacco use and decreased bone density, however, is hard to determine whether a decrease in bone density is due to smoking itself or to other risk factors common among smokers. Cigarettes' smoking promotes osteoporosis condition in which bones weaken and are more likely to fracture (Law and Hackshaw , 1997). Smoking is one of the most common practices and believed to be associated with decreased bone density and calcium absorption therefore abnormalities of both parathyroid and alkaline phosphatase are expected in smokers (Faroug, *et al*., 2014)

Alkaline phosphatase (ALP, ALKP, ALPase, AlkPhos) is a hydrolase enzyme responsible for removing phosphate groups from many types of molecules, including nucleotides , proteins , and alkaloids. The process of removing the phosphate group is called dephosphorylation. As the name suggests, alkaline phosphatases are most effective in an alkaline environment. It is sometimes used synonymously as basic phosphatase (Tamas, *et al*., 2002). Alkaline phosphates activity is present on cell surfaces in most human tissues. The highest concentrations are found in

the intestine, liver, bone, spleen, placenta, and kidney. Activity in bone is confined to the osteoblasts, those cells involved in production of bone matrix. ALP may be seen in variety of bone disorders Paget's disease, osteosarcoma, other bone disorders include Osteomalacia, rickets hyperparathyroidism (Wilske, 1995).

Normal ALP levels in adults are approximately 20 to 140 IU/L, though levels are significantly higher in children and pregnant women. Adults have lower levels of ALP than children. Bones that are still growing produce higher levels of ALP. During some growth spurts, levels can be as high as 500 IU/L. For this reason, the test is usually not done in children, and abnormal results refer to adults (Richard, 2007).).

Electrolytes and minerals are involved as catalysts in most cellular enzyme catalyzed reactions and assume a major role in metabolism. They have multiple functions such as holding fluids in compartments of the body and maintaining normal acid-base balance, nerve conduction, blood clotting and muscle contractions (Srinivasan, *et al*., 2006).Serum calcium and phosphate regulate by two hormone parathyroid hormone and active vitamin D_3, the active vitamin increase absorption of both calcium and phosphate in small intestine and also their absorption in renal tubule and enhance the increase level of calcium and phosphate in plasma.(Villabance ,*et al*. 2000)

This study aims to evaluate the effect of smoking on serum calcium, phosphate and alkaline phosphate activity.In addition to correlate the estimated parameters with smoking onset and numbers of cigarettes smoked per day.

Material and Method

Study design

The study was done in Khartoum state as case- control study. Samples selection was done during period April – August 2014.

Study population

Hundred healthy males who have been smoking cigarette (5 years or more with average threecigarettes per day or more) were selected as test group and hundred healthy nonsmokers were selected as control group. Both groups were matched in ageand bodyweight.

Study objectives

To evaluate effect of smoking on serum level of calcium,phosphate and alkaline phosphate activity.In addition to correlate the estimated parameters with onset of smoking and numbers of cigarettes smoked per day.

Exclusion criteria

Those with thyroid dysfunction, renal diseases, acute pancreatitis and those who have bone diseases are excluded.

Ethical consideration

Permission of this study was obtained from to local authorities in the area of the study. An informed consent was obtained from each participant in the study after explaining objectives of the study.

Sampling

After informed consent and use local antiseptic for skin (70%) ethanol. 3ml of venous blood was collected from each volunteer in this study using disposable plastic syringe. The venous blood poured in plain container. After clotted centrifuge at 300 rpm to obtain serum.

Biomedical measurement

Serum level of calcium, phosphate and alkaline phosphatase activity were measured using spectrophotometer and spin companykits.

Statistical analysis

The dData was analyzed by using Statistical Package for Social Sciences (SPSS), Windows version16, 2012 SPSS, Inc, Chicago, IL, and USA. Mean, standard deviation,,T test and correlation were calculated

Results

In this study apparently healthy hundred cigarette smokers with mean age(32.13 ±1.54) years Body mass index (24.82)with average cigarettes smoking per day (11.36 ±8.4) and have mean history of smoking (12 ±11.37)were defined as case .While hundred copartners healthy nonsmokers with mean age(31.24 ±1.02) years and body mass index (25.02) were nominated as control(Table 1).

Baseline characteristic of study populationTable (1)

Parameters	Smokers	Non smokers
Age/years	32.13 ±1.54	31.24 ±1.02
BMI	24.82	25.02
Cigarette/day	11.36 ±8.4	0
Smoking history/years	12 ±11.37	0

At P ≤0.05 this study showed significant difference in Alkaline phosphatase(ALP) between smokers(167.38 ± 84.9) and nonsmokers (107.96 ±38.07) P value was 00.While there were significant differences in serum calcium and phosphorus for smokers (7.56 ±1.38, 7.56 ±1.38) and nonsmokers(7.71 ±1.00, 4.51 ±1.17),with P value 0.05 for both(Table 2)

Comparison ofestimated biochemical parameters of study population Table (2).

parameter	Smokers	Nonsmokers	P-value	Sig
ALP (IU/L)	167.38 ± 84.9	107.96 ±38.07	0.05	0.00
Calcium (mg/dl)	7.56 ±1.38	7.71 ±1.00	0.05	0.44
Phosphorus (mg/dl)	7.56 ±1.38	4.51 ±1.17	0.05	0.54

At P≤0.05 This study revealed positive correlation between age and Alkaline phosphatase(ALP) phosphate ,numbers of cigarettes per day and duration of smoking correlation coefficients(0.36, 0.08, 0.298).Duration of smoking showed high significant positive correlation with numbers of cigarettes smoked (0.663**) positive weak correlation with ALP (0.189) and negative correlation with serum calcium and phosphorus(-0.11, -0.30).Serum phosphorus level showed significant positive correlation with Calcium (0.295**) and ALP(0.065) .While, serum calcium level showed negative correlation with ALP(-0.154) Table (3).

Correlation between estimated parameters(Table 3)

parameter	ALP (u/l)	Calcium (mg/dl)	Phosphorus (mg/dl)	NO of cigarette	Duration of smoking
ALP (u/l)					
Calcium (mg/dl)	-0.154				
Phosphorus (mg/dl)	0.065	0.295**			
NO of cigarette	0.282*	0.00	0.045		
Duration of smoking	0.189	-0.11	-0.30	0.663**	
Age	0.36	-0.005	0.095	0.08	0.298*

Dissuasion

Many studies have reported an association between smoking and risk of osteoporosis and low bone mineral density. In the present study, significant increase in alkaline phosphatase, and no variations in serum calcium and phosphorus have been detected these could be justified either by the fact that human body compensate mild deficiency of these minerals by removal of bone calcium that result in constant levels of serum calcium and phosphorus or can be attribute to adequate intake of these minerals in the diet or due to increase reabsorption via renal tubules .On the other hand this mechanism of anti-depravity may lead to reduction in bone density over long deficiency onset.These findings agreed with those obtained byVillabance,*et al*., (2000) who reported serum calcium and phosphate regulate by two hormone parathyroid hormone and active vitamin D3 the active vitamin increase absorption of both calcium and phosphate in small intestine and also their absorption in renal tubule and enhance the increase level of calcium and phosphate in plasma. Tolstrup, *et al*., (2002) cigarette smokers are susceptible to coronary heart disease. It has been reported that the severity of coronary atherosclerosis is closely related to coronary artery calcification, which itself may correlated with serum calcium and phosphors concentration George, *et al*., (1990). Marshall,*et al*., (1998) Any interference with the action of vitamin D3 may lowering of both level of calcium and phosphate causing mobilization of calcium and phosphate from bone to plasma, but it action in renal tubule is to enhance reabsorption of calcium and loss of phosphate.The overall action of parathyroid hormone is to increase serum calcium and reduce serum phosphate. Steady variations in serum calcium and phosphorus between smokers and nonsmokers could be justified by previous results obtained by Padmava, *et al*., (2005) who reported chronic cigarette smoking might have induced alternation in membrane permeability properties of tissues and organs, which might have resulted in changes in signal transduction and electrolyte imbalance.

Conclusion

Serum calcium is slightly reduced in cigarette smokers and it correlatepositively with duration and number of cigarette smoked per day

Recommendation

Smokers should receive calcium supplement to minimize the effect of smoking on skeleton and reduce possibility of bone osteoporosis.

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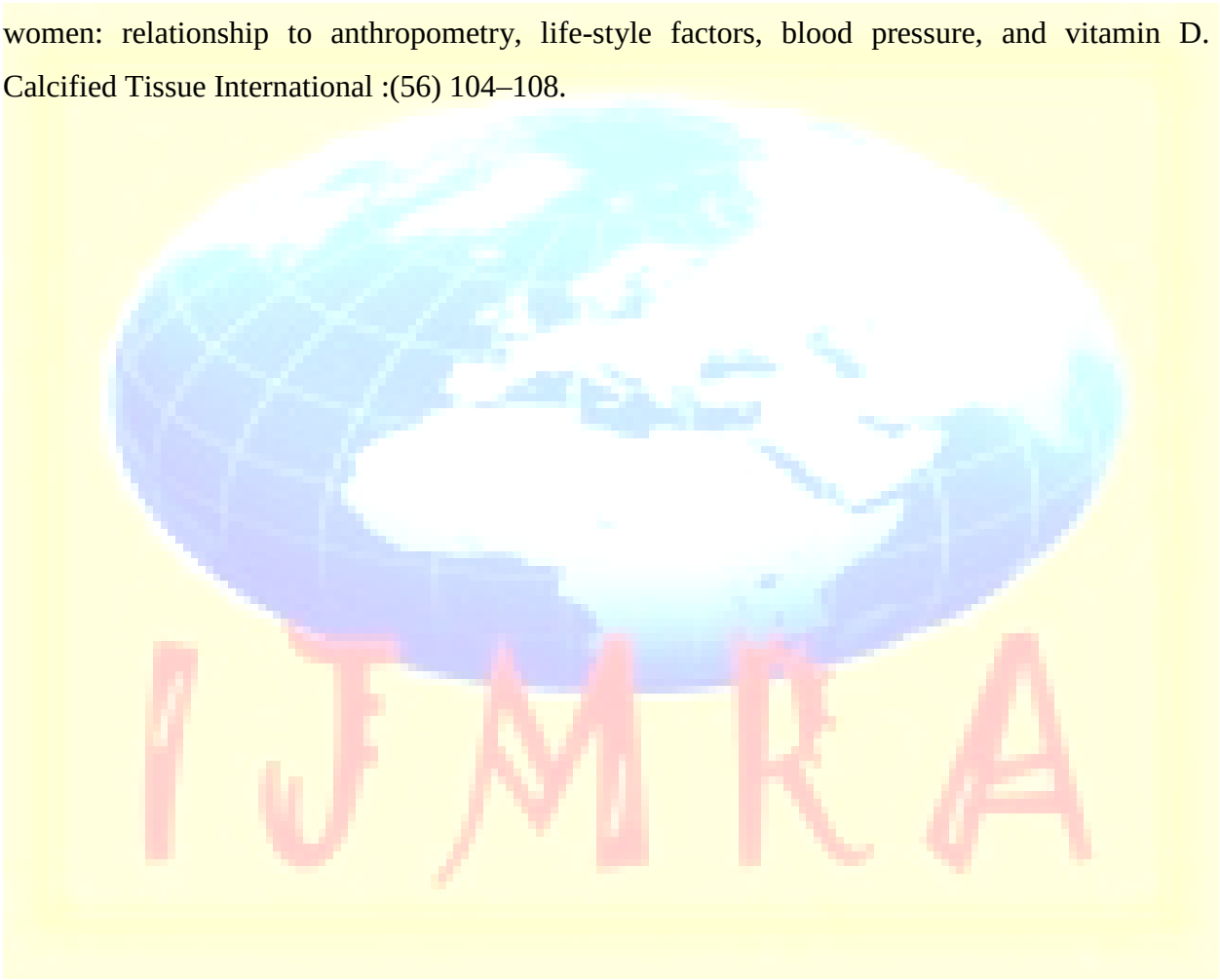

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