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Research Article

Prevalence of Vitamin D Deficiency among Healthy Saudi Men

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Abstract: Vitamin D deficiency was recognized as a health problem affect many different countries even a sunny area such as Middle East. Previous study done in Saudi Arabia among children and female had shown high prevalence of vitamin D deficiency in this area. Our study was done to demonstrate the prevalence of this problem among Saudi males.A total of 316 healthy Saudi males aged 30-50 years were included in this study. BMI, serum levels of calcium, phosphorus, ALP, iPTH, and vitamin D were measured beside the level of sun exposure for each individual.Nearly 98.80% of our subjects were suffering from vitamin D deficiency. Only iPTH level showed significant differences between severe, moderate, mild deficient and sufficient groups. Significant negative correlation of calcium and phosphorus levels was observed with age. Only vitamin D level was showed a negative correlation with iPTH level. In conclusion, Vitamin D deficiency is common among Saudi adult. Supplementation of this vitamin is recommended to prevent vitamin D deficiency complication in the future.
Keywords: Vitamin D deficiency, Saudi adult.

INTRODUCTION

Vitamin D is a fat-soluble vitamins which essential for maintaining healthy bone andessential for calcium and phosphorus homeostasis.Vitamin D works in concert with parathyroid hormone PTH and calcitonin to regulate serum calcium and phosphorus levels. The major source of vitamin D is the skin, where it is produced by the action of ultraviolet light on steroid precursors called 7-dehydrocholesterol (7-DHC) [1]. A variety of endogenous and environmental factors can alter the skin's production of vitamin D, including skin pigmentation, sunscreen use, clothing, latitude, season, time of day, and aging [2]. The second source for vitamin D is dietary intake and it is present in a limited number of foods such as oily fish, and oils from the liver of cod and tuna fish. In areas such as Saudi Arabia where there is plentiful sunlight and many food products are fortified with vitamin D, it would be expected that the vitamin D level would be adequate in the majority of the population, butAround 30 to 50% of children and adults in the United Arab Emirates, Saudi Arabia, and Lebanon have vitamin D levels below 20 ng/ml [3, 4]. The high prevalence of vitamin D deficiency primary may be due to low exposure of the skin to ultravioletradiation [5, 6]. Other factors associated with vitamin D deficiency include vitamin D receptor (VDR) polymorphism, low daily calcium intake, obesity and low social status [7]. Previous study for vitamin D level in Saudi Arabia was shown that, vitamin D deffeciency is common among Saudi children [8]. Other study upon female concludes that there was a high prevalence of vitamin D deficiency among Saudi female. The aim of this study was to determine the prevalence of vitamin D deficiency in a sample of Saudi men.

METHODOLOGY

The calculated sample size was consisted of 315 healthy Saudi men who were lived in Jeddah and visit the Centre of Excellence for Osteoporosis Research (CEOR) in King Fahad Medical Research Center in King Abdulaziz University over a 12 months period from September 2010 to September 2011, recruited randomly, aged 20-50 years. A standard questionnaire was used to collect information fromeach subject about Age, body weight, height, BMI, medical history about the presence of some chronic diseases (such as diabetes mellitus and hypertension)to be excluded and make sure that any individual included in this project was healthy. In addition, information about lifestyle, nutritional intake, duration of daily sun exposure, and the use of vitamins and medications to make sure any individual included in this project was not used any medication that may affect calcium and vitamin D levels. Blood from overnight fasting subjects (10-12 hours) were collected under standardized condition at plane tube for calcium, phosphorus, ALP, iPTH, and 25(OH) vitamin D levels estimation. The parameters such as calcium, phosphorus, and ALP were measured using VITROS 250 Chemistry System Autoanalyzer.

The iPTH was measured by direct sandwich chemiluminescence immunoassays using LIASON autoanalyzer [9].Quantitative determination of serum 25(OH) vitamin D was measured by direct competitive chemiluminescence immunoassays (Liason Diasorin) [9]. According to serum 25(OH) vitamin D level, our subjects classified into a numbers of classes include: class I severe deficient subjects in which serum vitamin

D level less than 12.5 nmol/l; class II with moderate deficiency of serum vitamin D level which ranged between 12.5-25 nmol/l; class III mild deficiency in which the serum vitamin D ranged between 25-50 nmol/l; class IV insufficient in which the vitamin D ranged between 50-75 nmol/l; and finally class V sufficient vitamin D level which had vitamin D level more than 75 nmol/l [10].

Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software version 16 (SPSS Inc., Chicago, IL, USA). The correlations were tested by Spearmans test. Comparisons were performed by ANOVA (analysis of variance). Comparisons and correlations were considered statistically significant when $P<0.05$.

RESULTS

Our data showed a high prevalence of vitamin D deficiency among Saudi men. There was about 12.34% with severe vitamin D deficiency, 61.58% with moderate deficiency, 24.88% with mild deficiency, 1.20% with insufficient level, and no anyone included in our project has a sufficient level of vitamin D.Table 1, showed mean±SD of age, BMI, calcium, phosphorus, ALP, iPTH, and 25(OH) vitamin D serum levels. This table also showed significant differences in only iPTH levels between our four groups with higher level in severe vitamin D deficient group by using ANOVA. Table 2, showed a correlation between our parameters using Spearman test. Age showed a significant negative correlation of age with calcium, phosphorus, and ALP levels, while a significant positive correlation with BMI and iPTH level. In addition, BMI showed a significant positive correlation with iPTH level. Finally, serum vitamin D level showed only a significant negative correlation with iPTH level.

Table1: Age, BMI, s-Ca, s-PO_4, s-ALP, and s-iPTH in severe, moderate, and mild deficient and sufficient individual expressed as (Mean±SD) and comparison by using ANOVA

	Severe deficient N= 39	**Moderate deficient N=193**	**Mild deficient N=78**	**Sufficient N=6**	**p value**
Age (years) (mean±SD)	34.23± 1.57	35.61 ± 0.68	35.63 ± 1.09	39.00 ± 4.11	
BMI (mean±SD)	27.78±0.81	27.86± 0.35	28.20 ± 0.49	27.30 ± 1.82	
s-Ca (mmol/L) (mean±SD)	2.40 ± 0.02	2.39 ± 0.01	2.40 ± 0.01	2.39 ± 0.05	
s-PO_4 (mmol/L) (mean±SD)	1.23 ± 0.02	1.24 ± 0.01	1.24 ± 0.02	1.26 ± 0.06	
s-ALP (U/L) (mean±SD)	82.79 ± 3.15	75.65 ± 1.40	77.01 ± 2.10	75.00 ± 9.05	
s-iPTH(pmol/L) (mean±SD)	7.52 ± 0.39	6.22 ± 0.18	5.60 ± 0.22	4.95 ± 0.93	* 0.00

BMI(body mass index), Ca (calcium), PO_4 (phosphate), ALP (alkaline phosphatase), iPTH (intact parathyroid hormone).
* $P< 0.05$ is considered significant.

Table 2: Correlation between age, BMI, s-Ca, s-PO_4, s-ALP, s-iPTH, and s-vitamin D in severe, moderate, and mild deficient, and sufficient individual by using Pearson`s correlation coefficient.

	Age	BMI	Ca	PO_4	ALP	iPTH	Vitamin D
Age		** 0.383	** -0.254	** -0.162	** -0.149	** 0.207	
BMI			** -0.183			* 0.132	
Ca				** 0.162			
PO_4					* -0.133		
ALP							
iPTH							** -0.216

BMI(body mass index), Ca (calcium), PO_4 (phosphate), ALP (alkaline phosphatase), iPTH (intact parathyroid hormone)
** Correlation is significant at 0.01 level
* Correlation is significant at 0.05 level

DISCUSSION

Vitamin D plays a critical role in bone metabolism and many cellular and immunological processes[11].Vitamin D is synthesized in the skin through exposure to UV radiation, and sun exposure is the primary source of vitamin D for most people [12]. Vitamin D deficiency still continues to become unrecognized epidemic problem in many countries around the world. It has been reported in healthy and diseased male and female, children, young, adult and elderly. Previous studies showed that, 30-50% of children and adult in United Arab Emirates, Turkey, and Lebanon have vitamin D deficiency. In Saudi Arabia there was a sufficient sunlight to maintain vitamin D synthesis in people who lived there [13]. Instead of that, our study showed high prevalence of vitamin D deficiency in Saudi men. Nearly 12.34% of our study population had severe vitamin D deficiency, while 61.58% and 24.88% had moderate and mild deficiency respectively. The reminder 1.20% had insufficient level of vitamin D. Totally 98.80% of our subject had deficient vitamin D level, and this ratio is very high compared with 37% in Mir Sadat *et al.*, [14] study, or 67.8% in Naeem *et al.*,[15] study. In accordance with our study, Al-Elq study showed high prevalence of vitamin D deficiency about 100% in Saudi medical students (male and female) [16]. A similar high prevalence of low vitamin D was reported among patients from Eastern Province of Saudi Arabia [17]. In Western region, Al-Ardawi study found that, 80% of Saudi women in this region had a high prevalence of vitamin D deficiency [18]. Different factors can affect vitamin D synthesis through UV effect on the skin, including skin pigmentation (synthesisdecreases in dark skin), ageing (vitamin D synthetic capacity decreases with ageing), and the use of sun blocking agents.But most individual in our study have daily exposure about 30 minutes which is sufficient for skin vitamin D synthesis but may be the wearing of Saudi traditional clothes include ghotra and thob which covered most men bodies and prevent the ultraviolet from reaching their skin.

Vitamin D is also acquired from the diet from natural sources such as fatty fish, fish oil and eggs, or from fortified products such as milk and orange juice and from supplements [13]. In our study the nutritional cause of vitamin D deficiency can be neglected because many food products in Saudi Arabia are fortified with vitamin D and our subject questionnaire showed that most of them eat fortified nutrient such as milk and cheese daily.

Vitamin D is essential for calcium and phosphorus homeostasis.1,25 (OH)-vitamin D works in concert with PTH and calcitonin to regulate serum calcium and phosphorus levels. When dietary calcium intakeis not availableor inadequate to satisfy the body's calcium needs,1,25 (OH)-vitamin D stimulates osteoclastogenesis by activating osteoclasts for bone resorption, and as a result maintaining the blood calcium in an acceptable physiologic range [19]. In healthy adult subjects the lower limit for the normal range of serum 25-hydroxyvitamin D is approximately 50 nmol/ml. When serum 25-hydroxyvitamin D values fall below this threshold, there is an increase in PTH secretion that may increase bone resorption and complicated to the osteoporosis. A long-lasting and severe deficiency of vitamin D, as defined by a serum level of 25-hydroxyvitamin D lower than 25 nmol/l, is associated with a low-normal blood calcium, low-normal fasting blood phosphorus, and elevated PTH levels that cause a mineralization defect in the skeleton [10, 19]. Our study showed decrease calcium, phosphorus, and ALP levels with aging as many previous studies , but there was no any correlation between serum vitamin D level and the level of this parameters) [17, 20]. In addition, our data showed increase iPTH with increase the severity of decrease vitamin D level, which is in accordance with previous metabolic cascade.

In conclusion, vitamin D deficiency is very common among Saudi men and the cause of this deficiency in mostly sunny area may be due to ethical or genetic factors. Supplementation of vitamin D should be recommended to prevent its complication through future and further studies should be planned to discover the ghost that present behind this problem.

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