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Vitamin D Deficiency Among Adults Attending Primary Health Care Centers in Abu Dhabi, United Arab Emirates

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Abstract

Background: Deficiency of vitamin D is very common. It has been recognized as a pandemic worldwide.Although it's sunny throughout the year, it is more common in the Middle East and Gulf region. **Objectives:** The goal of this study is to ascertain the prevalence of vitamin D deficiency in adults aged 21 to 60 years of age and to explore its relationship to different variables. **Patients and Methods:** A cross sectional study of 370 adults, aged 21-60 years,was conducted. A random selection of individuals was done from six primary health care clinics in the city of Abu Dhabi, United Arab Emirates, in the year of 2012.Serum levels of 25-hydroxy vitamin D, demographic data, body mass index, presence or absence of diabetes mellitus, hypertension, dyslipidemia, chronic kidney disease and inflammatory bowel disease were the variables of interest.The cutoff values for vitamin D were defined as follows: deficient (<50nmol/L), insufficient (50-75 nmol/L) and normal (≥ 75 nmol/L). **Results:** 237 (64%) of subjects were vitamin D deficient, 98 (26.5%) were vitamin D insufficient and only 35 (9.5%) were vitamin D sufficient. Vitamin D deficiency was more frequent in females than males [181(65.6%)vs. 56(59.6%)]. Higher prevalence of vitamin D deficiency was particularly noted in the age group 21-30 years (73.6%). No statistically significant relationships were noted between deficiency of vitamin D and ethnicity, diabetes mellitus, hypertension, dyslipidemia, chronic kidney disease and inflammatory bowel disease. **Conclusions:** Deficiency and insufficiency of vitamin D are very common among adults attending primary health care centers. It is more common in females and younger age groups. No other statistically significant relationships were noted.

Keywords: Vitamin D deficiency, Adults, Abu Dhabi

Introduction

The prevalence of vitamin D deficiency is high worldwide (1). Many studies conducted worldwide have confirmed the

high prevalence of this emerging problem. In the Gulf region, the prevalence of vitamin D deficiency is high regardless of the sunny climate throughout the year (2). A systematic review measuring the prevalence of osteomalacia, rickets and hypovitaminosis D in The kalhammadi@seha.ae Middle East and North Africa (MENA) region reported a high prevalence of hypovitaminosis D in the United Arab Emirates (3). The mean serum vitamin D level was close to 25nmol/L in the studied sample in the UAE, whereas in Saudi Arabia, several large population-based studies showed that the prevalence of vitamin D deficiency (<50nmol/L) is more than 80% (3).

Vitamin D is a distinctive hormone precursor. It enhances the absorption of calcium and phosphorus in the small intestine and it is responsible for mediating skeletal mineralization and maintaining calcium homeostasis in the blood stream (4). The major reason for vitamin D deficiency is lack of sun exposure. Naturally occurring vitamin D is only present in very few sources of foods. Even when food is fortified with vitamin D, it is usually not adequate to provide the daily requirements for both children and adults. Lack of vitamin D results in rickets and can result in osteopenia, osteoporosis and fractures (5).

Deficiency and insufficiency of vitamin D have been shown in multiple studies to be associated with other disease states such as colon cancer, cardiovascular diseases, depression, diabetes mellitus, and multiple sclerosis (1).

The present study aimed to update our knowledge of the prevalence of vitamin D deficiency amongst the adult residents of Abu Dhabi, the capital of the United Arab Emirates and to enhance our understanding of the impact of age, body mass index (BMI), gender and ethnicity on serum vitamin D levels. Furthermore we wished to ascertain the relationship of vitamin D deficiency with other morbidities such as diabetes mellitus (DM), hypertension (HTN), dyslipidemia (DLP), chronic kidney disease (CKD) and inflammatory bowel disease (IBD).

Methods

Study design and population

The target population was 12,914 subjects. Based on a sample size calculator with 95% confidence interval and 50% margin of error, a sample size of 370 was determined. A cross-sectional study was conducted on 370 subjects (276 females; 94 males), aged 21-60 years who presented to any of the six primary health care (PHC) clinics located in the island of Abu Dhabi during the year 2012. Exclusion criteria were patients below 21 years of age and above 60. Ethical approval was granted by Institutional Review Board of Sheikh Khalifa Medical City (SKMC), Abu Dhabi, United Arab Emirates.

Data collection

Information Technology Department in SKMC provided the medical record numbers of all patients who had vitamin D level tested in any of the PHC centers. These are Al Bateen, Al Rowda, Al Mushrif, Al Zaafarana, Al Manhal and Al Khaleej. A data collection sheet was used that included patient identification number, age, gender, nationality, name of the clinic visited, serum vitamin D level, BMI and the presence or absence of DM, HTN, dyslipidemia, CKD and IBD.

Laboratory measurements

All blood samples assays were performed at SKMC. serum 25-hydroxy vitamin D (25OHD) concentration was measured using Roche vitamin D total assay. Patients' charts were reviewed for all needed medical information. The subjects were classified into three different groups according to their serum vitamin D levels. The classification of vitamin D levels were as follow: vitamin D deficiency ≤ 50 nmol/L, vitamin D insufficiency between 50 and 75nmol/L, and vitamin D sufficiency >75nmol/L. Subjects were classified, according to center for disease control and prevention (CDC), as underweight (BMI <18.5), normal weight (BMI 18.5-24.9), overweight (BMI 25-29.9), obese class I (BMI 30-34.9), obese class II (BMI 35-39.9), obese class III (BMI ≥40).

Statistical analysis

The analysis was carried out using the Statistical Package for the Social Science (SPSS 18, PASW statistical 18) Frequencies were expressed in percentage (%); and continuous variables were presented as mean ± standard deviation. Chi square test was used to explore the relationship between serum vitamin D levels and the relevant variables. Descriptive statistics were used to report serum 25(OH) D concentrations by age groups, gender, nationality, BMI, clinic visited, and the presence of DM, HTN, dyslipidemia, CKD and IBD. Statistical significance was defined as p-value <0.05.

Results

Demographic characteristics

Three hundred seventy patients were involved in the study.

The age of study participants ranged from 21 to 60 years. 276 were females (74%). The mean age for both genders was 40 years. Table 1 shows the demographic and social data of the studied sample. Approximately half of the studied sample was native UAE nationals and the others were expatriates of different nationalities.

Vitamin D status

Out of 370 study participants, 237 (64 %) were deficient in vitamin D, 98 patients (26.5%) were vitamin D insufficient and only 35 patients (9.5%) had normal values of serum vitamin D levels.

Vitamin D status, age, gender, and ethnicity

73.6% of subjects aged between 21-30 years had vitamin D deficiency. 69% of adults aged 31-40 years were vitamin D deficient. Moreover, 66.7% of subjects aged 41-50 years had vitamin D deficiency. Between adults aged 51-60 years, 40.3% were deficient. The relation between vitamin D value and age was statistically significant. p = 0.001 (Table 2). A significant relationship between gender and vitamin D value was noted;181 females (65.6%) were found to be deficient compared to 56 males (59.6%); p = 0.015 (Table 2). There were no statistically significant difference in vitamin D levels between UAE nationals and expatriates; p = 0.380 (Table 2).

Vitamin D status and body mass index

The mean BMI of the studied population was 29 kg/m2. Deficiency appeared to be more prevalent in the overweight population, 70(30%) of them had vitamin D deficiency, compared to underweight 2(0.9%), normal weight 57(25.1%), obese class I 44(19.4%), obese class II 32(14.1%) and obese class III 22(9.7%). However results

Table 1. Demographic and social characteristics of study sample.

Variables	Groups	Number	Percentage
Age	21-30	72	19.5
	31-40	126	34.1
	41-50	105	28.4
	51-60	67	18
Gender	Male	94	25.4
	Female	276	74.6
Ethnicity	UAE nationals	200	54.1
	Expatriates	170	45.9

Table 2. The differences between the distribution of vitamin D deficiency, insufficiency and sufficiency for age groups, gender, and ethnicity.

Characteristics		Vitamin D status [N (%)]			P- values
Variables	Groups	Deficiency	Insufficiency	Sufficiency	
Age	21-30	53 (73.6)	16 (22.2)	3 (4.2)	P=0.001
	31-40	87 (69)	27 (21.4)	12 (9.5)	
	41-50	70 (66.7)	27(25.7)	8 (7.6)	
	51-60	27 (40.3)	28(4.8)	12 (17.9)	
Gender	Male	56 (59.6)	22 (23.4)	16 (17)	P=0.015
	Female	181(65.6)	76 (27.5)	19(6.9)	
Ethnicity	UAE nationals	134 (66)	50 (25)	16 (8)	P=0.380
	Expatriates	103 (60.6)	48 (28.2)	19 (11.2)	

were statistically insignificant.

Vitamin D status and other co-morbidities

Diabetes mellitus was present in 52 patients (14.1%), hypertension in 76(20.5%), dyslipidemia in 183(49.5%) and chronic kidney disease in 7(1.9%). None of the study subjects had inflammatory bowel disease. No statistically significant correlation was detected between any of these variables and vitamin D status.

Discussion

The prevalence of deficiency of vitamin D among adults attending PHC centers in Abu Dhabi is remarkable. This is similar to reported findings of previous studies from other Gulf and Middle East countries (4). The results of this study confirm the high prevalence of vitamin D deficiency in adults in Abu Dhabi City and that it is more common in females. The age group most affected is 21-30 years old. No significant relationships were noted between vitamin D levels and demographic and clinical variables.

The results of the study confirmed the higher prevalence of vitamin D deficiency in females compared to males. A study done to assess vitamin D status among adult Saudi females visiting primary health care clinics showed vitamin D deficiency prevalence of 79 % when defined as serum 25(OH) D <25 nmol/L (6).Vitamin D deficiency in women from MENA region has been attributed to poor exposure of skin to sunlight due to the traditional style of dressing, which covers most of the body (7,8). This was confirmed by another study conducted in a Jordanian population. Women who wore the *Niqab* and *Hijab* had considerably lower concentrations of vitamin D (9). *Hijab* is covering the whole body except the face, hands and feet while *Niqab* includes covering the face too. A study of Arab-American women has also reported a significantly higher prevalence of vitamin D deficiency in those who dressed conservatively compared to their counterparts who dress less conservatively as described by the authors (10). In the present study, no statistically significant differences were noted between vitamin D levels in the UAE nationals compared to expatriates, which could be attributed to the same lifestyle being adopted by both groups, particularly that a large proportion of female patients may have come from similar cultural backgrounds to the native Emiratis. Other possible contributing factors include the avoidance of sun exposure because of hot weather and the inadequate intake of vitamin D in food (11).

Aging was considered a risk factor for vitamin D deficiency in many previous reports. However, in the present study showed that frequency of vitamin D deficiency was noted to be higher in younger age groups. Possible contributing factors to this finding could be due to more indoor activities in younger ages that can limit sun exposure time. Furthermore, older adults are more likely to receive vitamin D supplements as they have regular follow up for other co-morbidities. Another contributing factor is lack of diets rich in vitamin D, due to inadequate fortification. Moreover, many younger adults tend to consume fast food rather than healthier options (11).

Obesity is a well-known risk factor for vitamin D deficiency. Vitamin D tends to deposit in the adipose tissue resulting in decreased serum levels of vitamin D (12). This study showed higher prevalence of vitamin D in overweight subjects rather than obese subjects but this was not statistically significant. In contrast to other studies, this study did not show any significant relationship between vitamin D level and diabetes mellitus, hypertension, dyslipidemia, chronic kidney disease and inflammatory bowel disease.This can be attributed to the small sample size and the representation of this condition is small, making conclusion about possible associations with vitamin D deficiency not accurate.

Our study has some limitations. The most important ones are the reliance on the newly introduced electronic documentation, in the sense that the diagnosis items may have been missed. Results of this study could be overestimating the prevalence of vitamin D deficiency as most patients who visited the primary care centers may had an indication for doing the vitamin D test. Furthermore, the lack of direct interaction with the subjects may limit the amount of infromation provided to explain certain findings. For example, to ilucidate why younger ages are more likely to be vitamin D deficient, a direct question about their daily activities, sun exposure, dietary habits may explain the findings. Lack of information about the use of vitamin D supplmetation is a major limiting fator that may affect the interpretation of our results. Many of the previous studies of the different age groups were descriptive in nature. There is a dire need for detailed analytical research to enable us to understand the problem better.

The *Weqaya* (Arabic word for prevention) program was launched in 2008 (13,14). It's a cardiovascular screening program, which screens for a number of chronic diseases as well as the vitamin D level for all UAE nationals. This has

led to increased diagnosis of vitamin D deficiency and early treatment. Given that vitamin D deficiency is more common in females and younger population, targeted awareness programs are needed to provide knowledge about vitamin D importance, sources, diagnosis and treatment methods. Another recommendation is to provide more private areas for females practicing conservative styles, where they can get adequate sun exposure. Furthermore, additional studies are needed to identify the direct relationship to other contributory factors like inadequate amount of vitamin D in fortified food. Results of this and other studies can help influence health policies.

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