

Vitamin D Deficiency, the Volume of the Problem in the United Arab Emirates. A Cohort from the Middle East

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Introduction

During the last two or three decades, Vitamin d deficiency has become an extremely hot scientific area of research. Given the background of vitamin D synthesis, and since its human production is solely based on the sun exposure. We expect Vitamin D deficiency to be an un-noticeable clinical burden in the Middle East. Sunny days in the Middle East run through, almost, the whole year. Al Anouti et al. unveiled an important clinical observation when they examined the vitamin D level in random sample of university students in Al Ain city in the United Arab Emirates (UAE). The average Vitamin D level during summer was 20.9 +/- 14.9 and 27.3 +/- 15.7 ng/ mL in females and males respectively. While winter vitamin D levels in females found to be 31.3 +/- 12.3 ng/ mL. The researches thought this summer high rates could be due to sun light avoidance during the hot summer in this region [1].

Vitamin D deficiency in UAE, and based on multiple clinical sets of data, has been proven to be a major health issue. A study from Dubai, the second largest emirate (state) in the United Arab Emirates (UAE), showed prevalence of vitamin D levels < 30ng/ ml (deficiency and insufficiency) of 81% out of 2836 individuals who attended the biggest governmental hospital in Dubai [2].

Different studies have shown similar indices of the unexpected high prevalence of vitamin D deficiency in the Middle East region [3-5]. Most of the researchers attributed this to the avoidance of sun exposure plus or minus inappropriate dietary habits [6-8]. Nonetheless, this problem is not only confined to the adult population. A study conducted among the adolescents in Al Ain city (UAE), showed prevalence of vitamin D < 30ng/ ml of 65%, the lower percentage could be explained by longer sun exposure at school age [9].

In this study, we are looking into the depth of the problem in Dubai; we evaluated all the vitamin D tests results in the Dubai

governmental hospitals and clinics (Dubai health Authority) over the period of 2007 to 2015.

Dubai Health Authority (DHA) is the only governmental group of hospitals and primary health care centers. Out of the 2.2 millions Dubai citizens, all Emirati nationals receive free treatment there, so they usually prefer treatment within the DHA facilities. All those who work for the government and the government-allied companies get their treatment for free. Moreover, DHA receives the majority of the daily emergencies being the main tertiary hubs in the city. This makes the sample reflecting, to a large extent, the true prevalence of any disease, when we are assessing it retrospectively.

Patients and Methods

Objectives

Primarily we wished to assess the prevalence of vitamin D deficiency in the population of Dubai. Secondarily, we aimed to evaluate further the specific prevalence in males and females separately, prevalence at different ages and in ethnic groups.

Study design and population

This is a retrospective study that has been conducted in Dubai Health Authority, Dubai, United Arab Emirates; the aim of the study is to assess degree of vitamin D deficiency and insufficiency in the population of Dubai.

We included all patients aged 3-100 years who attended any of Dubai health authority clinics in the period between Jan 2007 till May 2015. We collected the patients who had their first vitamin D level before starting vitamin D supplementation.

Our data collection sheet included patients' age, gender, nationality, vitamin D level, and creatinine.

Biochemical analysis

All vitamin D measurements in Dubai Health Authority are performed locally at a single reference biochemistry laboratory. A radioimmunoassay method (Diasource, Louvain-la-Neuve, Belgium) was used with standard internal and external quality assurance practices.

Definition

Vitamin D deficiency was defined according to our local laboratory values as a 25 (OH) D below 10 ng / ml, insufficiency as a 25 (OH) D of 11-29 ng / ml and sufficient when 25(OH) D is 30-100 ng/ ml.

Data analysis

Data analysis was performed on SPSS software 16.0. In all analyses, a *p-value* < 0.05 was considered significant and *P* < 0.001 was considered highly significant. Quantitative variables were described as mean; Standard Deviation (SD) and range, qualitative were described as variables as number and percentage.

We have used the Chi-square test to compare qualitative variables between groups.

Results

We have assessed 112,499 patients. 64.5% of the patients (n = 72,610) were females, while 35.5% of the patients were males (n = 39,889). 77.2% were Arabic inhabitants (n = 88,755), while 22.8% were non-Arabs (n = 23,744), Emirati were 76.3% of the total population.

29.5% of the patients (n = 32,968) had vitamin D levels < 10ng/ ml. vitamin D of 10-30ng/ ml was found in 63.3% of the patients (n = 70653) (Table 1; figure 1).

Out of the males patients 20.8% (n = 8242) and 72.8% (n = 28837) had vitamin D level of < 10 and 10-30 ng/ ml, respectively. While the females cohort 34.3% (n = 24726) had vitamin D level < 10ng/ ml, and 58.1% (n = 41816) had vitamin D level 10-30ng/ ml with high statically significant difference (*p* = 0.00). Only 31 males (0.1%) and 125 (0.2%) females had vitamin D level > 100ng/ ml (figure 2).

When compared vitamin D levels in Arabs and other nationalities we found that vitamin D < 10 ng/ ml was seen in 31.4% of Arabs (n = 29865) vs. 21.9% (n = 3093) from other nationalities, again 10-30ng/ml (n = 60240) vs. 73.7% (n = 10394), and 30-75 in 5.1% (n = 4801) of Arabs and 4.4% (n = 618) of other nationalities *p* = 0.00. Upon further analysis of the patients' nationalities; vitamin D deficiency was more prevalent in the Emiratis cohort than all the expatriates 32% vs. 24%, respectively with a *p* value of 0.001 (Table 2).

Levels of vitamin D at different age groups are shown in (Table 3). Interestingly, the middle-aged group of patients had the highest prevalence of vitamin D deficiency, where the younger patients (13-18 years) had 48.4% (n = 3794) and 49.9% (3906) levels of vitamin D of < 10 and 10-30 ng/ ml, respectively with a *p* value of 0.000 (Table 3).

Discussion

To our best knowledge there is no any published work on vitamin D with a number of patients similar to this data. Assessing 112,499 individual attending all the government hospitals in Dubai emirate between 2007 and 2015 makes it a very valuable and objective tool to assess the depth of the problem nationally,

Table 1: Distribution of the studied group according to vitamin D levels. This table shows majority of patients having Vitamin D insufficiency or deficiency.

Vitamin D level	Number of patients	%
< 10	32968	29.5%
10-30	70653	63.3%
30-75	7557	6.8%
75-100	300	0.3%
> 100	159	0.1%

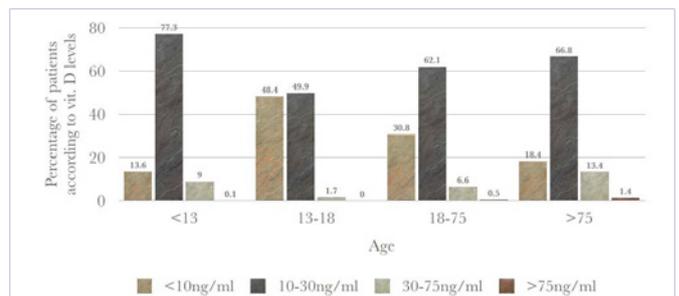


Figure 1: This graph shows distribution of the vitamin D deficiency and insufficiency according to the age groups.

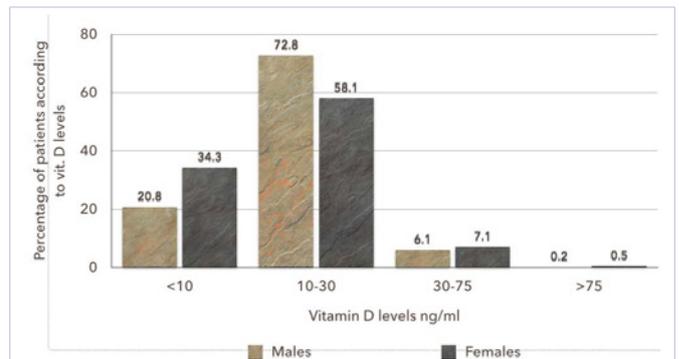


Figure 2: This graph shows the gender difference in the vitamin D deficiency and insufficiency..

and or regionally. Dubai population is just over 2.2 million people. We are assessing almost 4% of the total population, keeping in mind there are number of national patients attend those hospitals coming from other emirates.

Hypovitaminosis D is a pandemic problem and our findings of low vitamin D level in this large sample of residents of Dubai, United Arab Emirates (UAE), also emphasize the importance to address this problem effectively.

UAE in spite being a sunny subtropical country, with maximum span of summer in all seasons, is now widely known to have comparable vitamin D deficiency as other part of globe [10,11].

The composite prevalence of vitamin D deficiency and insufficiency in patients attending Dubai health authority was

Table 2: Comparison between vitamin D levels versus nationality.

Vitamin D level	Nationality		X ²	P
	UAE	Others		
< 10	27028 (32%)	6263 (24.3%)	6	P 0.0001 HS
10-30	53212(62.9%)	18263 (71%)		
30-75	4292 (5.1%)	1199 (4.7%)		
75-100	5 (0.0%)	0		
>100	57 (0.1%)	4 (0.0%)		
	Nationality			
	Arabs	Others		
<10	29865 (31.4%)	3093 (21.9%)	5.8	0.0001HS
10-30	60240 (61.3%)	10394 (73.7%)		
30-75	4801(5.1%)	5.8		
75-100	5 (0.0%)	0		
>100	58 (0.1%)	3 (0.0%)		

This table shows that UAE had higher vitamin D deficiency rates compared to other nationalities with statistically significant difference by using chi-square test. While, overall Arabs had higher prevalence of vitamin D compared to other nationalities with statistically significant difference by using chi-square test.

Table 3: Relation between vitamin D level and different age groups.

Vitamin D level	Age				X ²	P
	< 13	13-18	18-75	> 75		
<10	1938 (13%)	13-18	26673 (30.8%)	563 (18.4%)	3.7	0.000 HS
10-30	11033 (77.3%)	3794 (48.4%)	53669 (62.1%)	2044 (66.8%)		
30-75	1281 (9%)	3906 (49.9%)	5736 (6.6%)	410 (13.4%)		
75-100	17 (0.1%)	130 (1.7%)	251 (0.3%)	30 (1%)		
>100	7 (0.0%)	2 (0.0%)	137 (0.2%)	12 (0.4%)		

This table shows that younger age group less than 13 had lower vitamin D level compared to older age group with statistically significant difference by using chi-square test.

found to be surprisingly high (92.7%) and this is a confirmatory replication of different studies conducted in this region, Middle East. A study conducted by the same group of this paper on the patients attending a general hospital in Dubai showed prevalence of 93.3% [2].

We found significant number of both males and females with vitamin D deficiency however percentage of female who are deficient is more than males. This observation has been seen before [12], and contributed to physiologic stress like pregnancy, lactation, low physical activity, and inadequate dietary vitamin D consumption [13,14]. Traditionally females here are not much exposed to outdoors and though in local UAE population both males and female usually covers whole body and limbs, but in general, Arab females observe covering of arms and face also [15,16], which can contribute to more pronounced vitamin D deficiency in them [17]. Skin exposure to sunlight is of prime importance as vitamin D is synthesized from a precursor 7-dehydrocholesterol naturally present in the skin

,which subsequently converted to active vitamin D after 2 step hydroxylation in liver and kidney [18].

This is one of the reasons that elderly people usually have low vitamin D level as skin concentration of 7- dehydrocholesterol gradually declined with growing age. A 70-year-old male will have 25% less of this vitamin D precursor than a young adult [19].

Our findings that young adults have equal chances of vitamin D insufficiency like middle aged individuals replicating the results observed by Tangpricha et al. (2002)[20]. Indeed our observation that adolescent residing in Dubai have much higher percentage of vitamin D deficiency than expected, has been seen before by a group of investigators in Al-Ain, United Arab Emirate, they found majority of young Emirati girls attending public school, aged between 11-18year, were deficient in Vitamin D [21].

Our findings of low vitamin D level in young healthy males are also seen in a study done in Saudi Arabia: Riyadh region where

young males aged between 18-23 years were found to have vitamin D deficiency [22].

This problem is not limited to middle East region it has been identified in many previous studies in other parts of world as well [23,24] these observations dictate the need to address this issue of low vitamin D level in these young adolescent from beginning to anticipate adverse bone health outcome from early age.

Our study despite having observed first ever checked vitamin D level in a huge number of individuals in our data base, have many limitations, being a retrospective study, we cannot identify the associated co morbid condition like malabsorption, obesity [25], dietary habits [26], physical activities, seasonal variation [27] and history of vitamin D supplement, which all may have some influence on level of vitamin D compare to healthy individuals. But at least the yield of our observation carries enough strength to confirm the burden of this problem in residents of Dubai and encouragement of more sun exposure and life style modification. This study may also in future be able to answer the optimal level of vitamin D that has been a topic of debate since long.

Conclusion

Vitamin D deficiency is a very common medical problem in Dubai, the over all prevalence was 29.5%, while 63.6% had levels below 30ng/ ml 92.8% out of over 112,000 patients. Male are substantially affected more than females. There is statistically significant difference between Emiratis and the expatriates, with higher rates in emirates population. Those results need to be taken very seriously in terms of raising the awareness about the disease and the need for further studies about any associated health consequences, which may arise if left untreated. Nonetheless, having the prevalence of over 90% could raise a question whether the international cutoff points fit our region's population or not?

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