Vitamin D Status in Secondary Care Patients

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Background: Vitamin D deficiency is a growing problem worldwide and it is associated with a variety of diseases.

Objective: To evaluate the prevalence and risk factors for vitamin D deficiency in a sun-rich country.

Setting: Al Kindi Hospital, Bahrain.

Design: A Retrospective Study.

Method: Three hundred two patients were included in the study from 1 June 2009 to 28 February 2012.

The study included determination of the prevalence and severity of vitamin D and its correlation with age and gender. Data analysis was performed using SPSS software.

Result: Three hundred two patients were included in the study. Two hundred six (68.2%) females had 25(OH) D deficiency compared to 26 (8.6%) males. There was a statistically significant difference concerning gender (P-value= 0.014).

One hundred forty-two (48%) patients below 50 years had 25(OH) D deficiency compared to 90 (29.8%) patients above 50 years, P-value= 0.012. Pearson's correlation coefficient suggests a positive correlation as age increases (Pearson's r^2 = 0.180).

Conclusion: Low vitamin D is a growing health problem in Bahrain. Bahraini females had a significantly higher rate of vitamin D deficiency compared to males. We recommend earlier screening in women and young children. People who are at risk should be advised to increase their dietary calcium intake and vitamin D supplementation.

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Vitamin D deficiency is defined as a 25(OH) D below 20ng/ml (50 nmol/liter)[1,2]. Patients who were previously treated or are currently being treated for vitamin D deficiency and patients with vitamin D toxicity (serum values above 100 nmol/l) were excluded.

Vitamin D deficiency is a growing problem worldwide; it is associated with a variety of disease[3,4]. Vitamin D receptor is present in most tissues and cells of the body. Vitamin D deficiency could lead to complications, such as low bone mineral density, osteopenia and osteoporosis, cardiovascular and autoimmune diseases, and increased cancer risk[1,4,5]. Vitamin D deficiency evaluation is important to avoid diverse health conditions[3,6,7].

Bahrain exhibited a similar trend to other regional sunny Arabian Gulf Countries with regards to 25(OH) D deficiency; females had the highest prevalence of vitamin D deficiency. This can be explained by similar biosocial regional factors; sun avoidance strategies coupled with restrictive traditional clothing.

This study aims to evaluate the prevalence and the risk factors of vitamin D deficiency in a sun-rich country to identify patients at risk and provide early treatment.

METHOD

Three hundred two patients were included in this study between 1 June 2009 and 28 February 2012. Patients' personal

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and laboratory results were documented. Serum samples were collected for assaying 25(OH) D levels. The results were categorized into deficient or normal. All samples were assayed using the Roche Elecsys Vitamin D total assay [measuring range: 3-70 ng/ml (7.5-175 nmol/l)] with an analytical specificity for vitamin D3 approaching 100%.

Data analysis was performed using SPSS software. Categorical data were analyzed using Pearson's χ^2 and Chi-Square test was performed to compare relative distributions, and frequency in each group stratified by age and gender. P-value of less than 0.05 was considered statistically significant.

RESULT

Three hundred two patients were included in the study; 42 (14%) males and 260 (86%) females. The age range was 19-88 years. A statistically significant difference was found in the mean levels considering age and gender. The mean level of 25(OH) D was 17.73 nmol/l ±1.21. Patient's characteristics are shown in table 1.

Table 1: Patients Age and Gender

	Number	%
Gender		
Males	42	14%
Females	260	86%
Total	302	100%
Age Groups		
<50	173	57.3%
>51	129	42.7%
Total	302	100%

Table 2: Vitamin D According to Gender

Gender	Normal (70)	Deficient (232)	Total (302)
Male	16 (5.3%)	26 (8.6%)	42 (14%)
Female	54 (77%)	206 (68.2%)	260 (86%)
Total	**70 (23.2%)**	**232 (76.8%)**	**302 (100%)**

Two hundred sixty (86%) females and 26 (8.6%) males had 25(OH) D deficiency.) There was a statistically significant difference concerning gender (P-value= 0.014).

One hundred forty-two (47%) patients below the age of 50 years had vitamin D deficiency and 90 (29.8%) patients above the age of 50.

The observed difference between the age groups is statistically significant (P-value=0.012). Pearson's correlation coefficient suggests a positive correlation as age increases. (Pearson's r^2=0.180).

Table 3: Vitamin D and Age

Age Groups	Normal (70)	Deficient (232)	Total (302)
≤50	31 (10%)	142 (47%)	173 (57.3%)
>50	39 (13%)	90 (30%)	129 (42.7%)
Total	**70 (23%)**	**232 (77%)**	**302 (100%)**

DISCUSSION

Recent studies revealed a paradoxical phenomenon, wherein individuals of all ages living in sunny environments appeared to be at risk of vitamin D deficiency even in industrialized countries[3-5]. Vitamin D is obtained from several sources that include sunlight, diet, fortified food, and dietary supplements[3-5].

Sunlight is a major source of vitamin D for humans, as exposure from 10:00 H and 15:00 H in the spring, summer, and fall can produce vitamin D lasting twice as likely as ingested forms[1].

Although Bahrain is a sunny country, vitamin D deficiency has been on the increase amongst its population. A similar trend has been observed in regional Arabian Gulf Countries (Saudi Arabia, Oman, Qatar, Kuwait and the United Arab Emirates)[4,8-10].

Dietary and sunlight vitamin D is either stored in adipocytes or enters the liver and is converted to 25-hydroxy vitamin D, which is further metabolized to 1,25 hydroxy vitamin D in the kidney and interacts with the various vitamin D receptors in the body. The active vitamin D level is controlled by parathyroid hormone, serum calcium and phosphorus levels[3,6]. Physical inactivity and BMI greater than 30 Kg/m^2 has shown to decrease the availability of vitamin D in serum[1,11]. Serum levels of 25(OH) vitamin D is indicative of total vitamin D stores in the body[11,12].

Gender-specific differences appeared to be significant. In our study, 86% of females were found to have vitamin D deficiency compared to males (P-value <0.001).

The difference in fat composition between genders results in greater storage of vitamin D in women[1]. However, the remarkable difference can be attributed to biosocial regional factors, such as sun avoidance strategies, skin cancer and restriction of personal ambient exposure due to traditional clothing (full black veil covering the body except for the face and hands), sunscreen, dark skin pigmentation, limited outdoor activities[8-10,13].

The prevalence of hypovitaminosis D is significantly higher in Arab women and children than in Caucasians[14]. The population in these warmer climates tends to have darker skin pigmentation which can affect their ability to synthesize vitamin D[15]. Naturally, dark skin toned individuals need approximately three to five times longer sun exposure as light skin toned individuals to make the same amount of vitamin D[1].

In the past, children obtained most of their vitamin D from sun exposure and fortified milk[4]. Now, children and adolescents spend more time indoors and wear sun protection when outdoors. They are also drinking less vitamin D fortified milk[1]. Similar trends are seen in adolescents and adults because of decreased outdoor activities and aggressive sun protection[1]. Also in this group, there is decreased consumption of fortified milk, and the limited capacity of the intestine to absorb dietary vitamin D[1].

Hypovitaminosis D was prevalent in all age groups, no significant trends were observed. Despite the abundance of sunlight all year round, significant deficiency was observed; it is influenced by socio-cultural habits, lifestyle, dietary lack of vitamin D supplementation and fortification. Hence, a multi-level approach is needed to manage this emerging public health threat[4]. Education and awareness of vitamin D health benefits as a primary prevention should be targeted effectively[4]. Furthermore, vitamin D fortification of food needs to be implemented to target high-risk groups[4].

Evidence suggests that 25(OH) D blood levels should be maintained above 20 ng/ml to prevent rickets and osteomalacia[16]. However, levels should be above 30 ng/ml to maximize vitamin D's effect on calcium, bone and muscle metabolism[1].

CONCLUSION

Vitamin D has an important role in bone and muscle health. In Bahrain, it is apparent that low vitamin D level is a growing health concern and immediate precautions need to be taken. From our study, it is evident that Bahraini women had a significantly higher rate of vitamin D deficiency, mainly due to cultural and biosocial factors (low skin exposure, dark skin tone).

We recommend earlier screening in women and young children. People at high risk should be advised to increase their dietary calcium intake and vitamin D supplementation. Culturally sensitive education and awareness must be provided. This could be achieved by campaigns, social media, and routine tests in high risk individuals.

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