



Vitamin D status in general healthy population of Jazan region of the Kingdom of Saudi Arabia

Ahmed Jerah

Vice Dean, College of Applied Medical Sciences, Jazan University, Jazan, Kingdom of Saudi Arabia. - Corresponding Author

Anil Kumar Bidwai

Professor, College of Applied Medical Sciences, Jazan University, Jazan, Kingdom of Saudi Arabia.

ABSTRACT

The status of vitamin D in the general healthy population of Jazan region of the Kingdom of Saudi Arabia was evaluated. Five hundred and eight healthy male and female subjects above the age of 12 years were randomly selected from the region. The study subjects were divided into groups on the basis of age and sex. Vitamin D sufficiency was defined as a serum level of 25(OH)-D \geq 30 ng/mL. The level between 20-29 ng/mL was considered as insufficient whereas that below 20 ng/mL as deficient. Out of 508 study participants, ~29% were found deficient and ~57% were found insufficient. The study subjects sufficient for vitamin D were only ~14%. The deficiency appears to correlate with age as a greater number of subjects >40 years of age were found to be deficient or insufficient for the vitamin. The deficiency is more prevalent in females compared to males. Vitamin D deficiency/insufficiency appears to be a major health concern in Jazan region of Saudi Arabia. In this study more than 85% of the studied general population exhibited deficiency/insufficiency of vitamin D.

KEYWORDS : Vitamin D 25(OH)-D Vitamin deficiency Vitamin insufficiency

Introduction

Vitamin D has numerous important roles in human body. It regulates the metabolism of calcium and phosphate in the body [1]. These nutrients are required in order to preserve the bones and maintain healthy teeth. Vitamin D deficiency has traditionally been linked to poor bone health. A deficiency of vitamin D causes bone defects like rickets in children and osteomalacia in adults. Nearly 80% of vitamin D in human body is synthesized by the exposure to sunlight [2]. Vitamin D is also found in a small amount in a number of foods [3]. Therefore, the exposure to the sun and eating of certain foods fulfills the requirement for this vitamin. Vitamin D is naturally obtained from foods such as oily fish, eggs, fortified fat spreads, some fortified breakfast cereals and powdered milk. Moreover, results from several population studies have shown that a low level of this important vitamin may also be linked to a higher risk of ischemic heart disease, a designation that covers heart attack, coronary arteriosclerosis and angina [4]. Vitamin D may improve heart failure treatment outcomes. Other reports have demonstrated that its deficiency might be the cause for high blood pressure and it is well known that high blood pressure increases the risk of heart attack. Vitamin D supplementation decreases blood pressure [5].

Vitamin D may protect children from respiratory illnesses. Its deficiency may enhance effects of smoking on the lungs and may prevent improvements in lung function for some asthmatics [6]. Its deficiency increase obesity and puts a person at high risk of diabetes. Vitamin D supplementation has been shown to improve treatment of depression. Calcium and vitamin D help to reduce adult mortality rate. Recent findings have indicated that low vitamin D levels result in high cancer mortality rates in African Americans [7]. Low vitamin D in pregnancy may lead to overweight children [8]. Higher vitamin D levels may benefit multiple sclerosis patients [9, 10]. Vitamin D may slow prostate cancer growth. Wagner and coworkers [11] orally administered 400, 10,000, and 40,000 IUs of vitamin D daily to 66 men due for radical prostatectomy and observed that those who took vitamin D at 40,000 IUs/day had highest levels of calcitriol, the hormone derived from vitamin D with known anticancer potential. Calcitriol is known to lower Ki 67 levels. Ki 67 is a protein that is related to the severity of prostate cancer. Calcitriol also lowers elevated prostate-specific antigen levels and inhibits mutation of androgen receptors, two biomarkers of prostate cancer. The hormone also diminishes the blood supply of

prostate tumors preventing its growth and spread [12, 13]. Grant and Hollick [14] have reported that vitamin D enhances immunity. Researchers have found geographic differences in vitamin D deficiency rates. A recent work has shown links between vitamin D deficiency and heart disease, diabetes and death [15]. Vitamin D supplementation also benefits Alzheimer's patients [16]. Higher vitamin D levels may protect girls from stress fractures. Vitamin D levels may predict depression relapse. Symptoms of depression and fatigue are frequent in multiple sclerosis. Depression and fatigue have been associated with vitamin D deficiency and often occur in multiple sclerosis [17]. The research available on vitamin D clearly shows that its deficiency results into various diseases in humans. Therefore, it is necessary to bring awareness in society to prevent vitamin D deficiency and the associated health problems. A simple supplementation of the vitamin in diet and adequate exposure to sun light may prevent all these diseases [18].

In this work an effort has been made to investigate the level of vitamin D in the general population of Jazan region of the Kingdom of Saudi Arabia. A categorization of the levels as sufficient, insufficient and deficient has been done.

Materials and Methods

Subjects were randomly selected from the general population of Jazan region of KSA. Five milliliter of venous blood was drawn from 508 male and female subjects. Plasma/serum was separated by standard procedure used in clinical laboratory. 25(OH)-D was estimated by an ECLIA method. Briefly, 25(OH)-D in the sample competes with the biotin labeled vitamin D for binding with monoclonal 25(OH)-D-specific ruthenium labeled antibody. After addition of streptavidin-coated microparticles, the complex becomes bound to the solid phase via interaction of biotin and streptavidin. The microparticles are magnetically captured onto the surface of the electrode in the measuring cell of the ECLIA analyzer. Application of a voltage to the electrode then induces chemiluminescent emission which can be measured by a photomultiplier. Vitamin D concentration in the sample was determined via a calibration curve.

Results

A total of 508 healthy subjects (291 males and 217 females) were selected from the general population of the Jazan region of the Kingdom of Saudi Arabia for the evaluation of their vitamin D status.

Subjects were grouped into two groups according to their age (i) age 12-40 yrs. (ii) age > 40 yrs. Vitamin D status was categorized as under [19] –

Normal 25(OH)-D ≥ 30 ng/mL
 Insufficient 25(OH)-D 20-29 ng/mL
 Deficient 25(OH)-D < 20 ng/mL

Results of the vitamin D status in the two age groups are given in Table 1 and shown in Figures 1 and 2.

Figure 1 shows the status of vitamin D in male, female and total population and Figure 2 shows the vitamin status in the two age groups.

Table 1. Vitamin D status of subject population. Percentage of normal, insufficient and deficient subjects in each group is given in bold. Number of subjects in each group is given in parentheses.

Vitamin D Status	Males			Females			All		
	Age 12-40 yrs. (133)	Age > 40 yrs. (158)	Total (291)	Age 12-40 yrs. (111)	Age > 40 yrs. (106)	Total (217)	Age 12-40 yrs. (244)	Age > 40 yrs. (264)	Total (508)
Normal	20.3 % (27)	15.2 % (24)	17.5 % (51)	11.7 % (13)	5.7 % (6)	8.8 % (19)	16.4 % (40)	11.4 % (30)	13.8 % (70)
Insufficient	55.6 % (74)	57.0 % (90)	56.4 % (164)	57.7 % (64)	59.4 % (63)	58.5 % (127)	56.6 % (138)	57.9 % (153)	57.3 % (291)
Deficient	24.1 % (32)	27.8 % (44)	26.1 % (76)	30.6 % (34)	34.9 % (37)	32.7 % (71)	27.0 % (66)	30.7 % (81)	28.9 % (147)

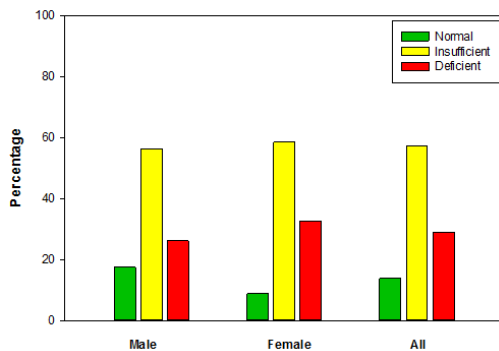


Figure 1. Figure shows percentages of normal, insufficient and deficient subjects in males, females and total.

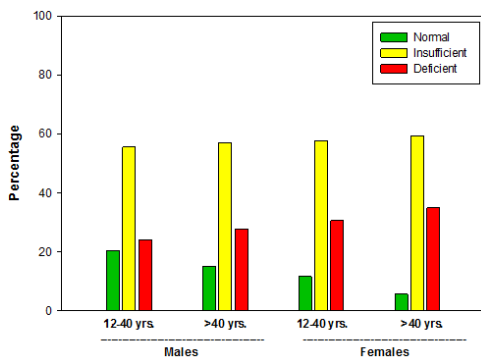


Figure 2. Figure shows percentages of normal, insufficient and deficient subjects in the two age groups in males and females.

Discussion

Vitamin D deficiency is a serious health problem all over the globe. It is related to several disease conditions in human beings. In this study, 28.9% of the investigated people were found deficient for

vitamin D and 57.3% insufficient for the vitamin (Figure 1). The females appeared to be more prone to the deficiency as the deficiency-insufficiency combined percentage in females was 91.2 vs. 82.5 in males. This may have relation to the largely indoor life style of females in Saudi Arabia resulting in lesser exposure to sunlight. The vitamin D deficiency in the studied population also seems to correlate with age (Figure 2) as in both the males and females a greater number of older subjects shows deficiency. In males, 79.7% in the age group 12-40 yrs. were low compared to 84.8% in the age group >40 yrs. The prevalence of deficiency-insufficiency was the largest in older women (94.3%). This suggests a combined effect of age as well as lesser exposure to sunlight on the vitamin status. It is likely that not only the endogenous synthesis but the absorption, conversion to 25(OH)-D and storage of the vitamin may decrease with age.

Our results correspond well with other published work on vitamin D in Saudi Arabia and elsewhere. A study performed recently among young healthy men living in Al-Qassim area of Saudi Arabia shows the prevalence of vitamin D deficiency between 28-37% [20]. Naeem et al. [21] further investigated vitamin D status in the population of the same part of the country and found that out of 180 investigated people, 51 (28.3%) subjects were vitamin D deficient, 71 (39.4%) were vitamin insufficient and 58 (32.2%) had normal vitamin D level. Other studies done in the eastern province of Saudi Arabia showed that the vitamin D deficiency was 50-80% [22]. A study in Spain on young, healthy adults [19] has reported a deficiency-insufficiency status of the vitamin in 83.6% subjects.

Thus it appears that the prevalence of the deficiency of vitamin D in Saudi Arabia is considerable. Long term strategies to address this deficiency problem should include public education, national health policies for screening and prevention through food fortification and treatment with vitamin D supplementation. Vitamin D deficiency is now considered as a pandemic. The major cause of vitamin D deficiency is the lack of appreciation that sun exposure in moderation is the major source of vitamin D for most humans. Very few foods naturally contain this vitamin and foods that are fortified with vitamin D are often insufficient to fulfill its requirement.

Vitamin D deficiency causes rickets in children and will precipitate and exacerbate osteopenia, osteoporosis, and fractures in adults. Vitamin D deficiency has been associated with increased risk of common cancers, autoimmune diseases, hypertension and infectious diseases etc. A circulating level of 25-hydroxyvitamin D of >75 nmol/L, or 30 ng/mL, is required to maximize vitamin D's beneficial effects on health. In the absence of adequate sun exposure, at least 800–1000 IU vitamin D3/day may be needed to achieve this in children and adults.

Conclusion

In conclusion, vitamin D deficiency is an epidemic worldwide and Saudi Arabia and many other sunny countries are no exception. Deficiency of vitamin D can result due to inadequate intake in food and lack of exposure to sunlight, disorders that limit its absorption from the gastrointestinal tract, conditions that impair conversion of vitamin D into active metabolites, such as liver or kidney disorders and body characteristics such as skin color and body fat. A considerable fraction of the population of Jazan region was found to have low levels of this vitamin. In order to minimize the consequences of vitamin D deficiency on Saudi population this health problem must be dealt with due attention and serious measures.

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