

Frequency of severe vitamin-D deficiency in patients presenting to a tertiary care hospital in Islamabad

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Abstract

Objectives: To determine the frequency of severe vitamin D deficiency in patients presenting in a tertiary care hospital in Islamabad and its possible causes.

Methods: The cross-sectional study involving 351 consecutive patients was conducted at the out-patient department of General Medicine, Federal Government Services Hospital, Islamabad, from September 2011 to June 2012. Both male and female patients between the ages of 13 and 65 were included in the study, while those having renal or liver failure and using drugs that could potentially cause a decrease in vitamin D3 were excluded. SPSS 17 was used for statistical analyses.

Results: Of the 351 subjects, 221(62.9%) were females and 123(37.1%) were male. The overall mean age was 46.03 ± 16.18 years. There were 251(71.5) subjects from Islamabad, followed by 51(14.6%) from Peshawar, 26(7.3%) from Rawalpindi, 7(2%) from Abbottabad while 16(4.6%) were from other parts of Pakistan. Overall, 225(64%) were aware of the importance of vitamin D, whereas 126(36%) were not; 246(70%) knew about the role of vitamin D in normal bone development, and 105(30%) did not know; 344(98%) didn't know what was meant by fortified food containing vitamin D, while 168(48%) experienced generalised body aches and pains and none of the patients had a fracture in the preceding one year. Vitamin D3 levels were decreased in 291(82.8%) subjects and the mean vitamin D3 level was 14.09 ± 12.93 ng/dL.

Conclusion: Undiagnosed vitamin D deficiency is prevalent in the community. With the magnitude of deficiency that is seen in our healthy population, fortification of food items is required.

Keywords: Vitamin D, Deficiency, Sun exposure. (JPMA 64: 1138; 2014)

Introduction

Vitamin D deficiency or insufficiency affects over one billion people in the world with South Asian countries being more severely affected.¹ Pakistani population seems to be especially prone to developing vitamin D deficiency because of less exposure of women to light (most commonly due to use of veil or sun blocks on exposed skin), excessive cooking, unbalanced diet and consumption of unfortified foods. It was with this reason in mind that the current study was conducted in the capital of Pakistan.

Subjects and Methods

The cross-sectional study involving 351 consecutive patients was conducted at the out-patient department of General Medicine, Federal Government Services Hospital, Islamabad, from September 2011 to June 2012. Both male and female patients between the ages of 13 and 65 were included in the study. Patients having renal or liver failure and using drugs that could potentially cause a decrease in vitamin D3 were excluded from the study. Data collection

was started after formal approval from the institutional ethics committee and after obtaining informed consent from the subjects. Patients were selected by consecutive sampling. Those enrolled in the study were evaluated regarding demographic profile, presenting conditions like diabetes mellitus type-2 (DMT2), hypertension, malabsorption, sun exposure, breast feeding, parathyroid and thyroid diseases and cancers. The participants were asked about the importance of vitamin D in their diet, role of vitamin D in normal bone development, use of fortified food containing vitamin D and whether or not they experienced generalised body aches and pains, or ever had a fracture in the preceding one year. Biochemical parameters i.e. vitamin D3 levels, serum calcium, phosphorous, alkaline phosphatase, renal function tests, liver function tests, and complete blood picture were also measured. All data was analysed using SPSS-17. Mean and standard deviations were calculated for quantitative variables i.e. age, weight, serum calcium, phosphorous, renal and liver function tests, haemoglobin, total leukocyte and platelet count and vitamin D3 levels. Frequency and percentages were calculated for gender, area of residence, associated conditions like diabetes mellitus, hypertension, malabsorption, sun exposure, breast feeding, parathyroid and thyroid disorders,

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cancers, and vitamin D3 levels.

Results

Of the 351 subjects, 221 (62.9%) were females and 130 (37.1%) were males. The mean age was 46.03 ± 16.18 years. There were 251 (71.5%) subjects from Islamabad, followed by 51 (14.6%) from Peshawar, 26 (7.3%) from Rawalpindi, 7 (2%) from Abbottabad while 16 (4.6%) were from other parts of Pakistan. The patients were asked about their present conditions and DMT2 was present in 33 (9.3%), hypertension in 37 (10.6%), decreased sun exposure in 160 (45.7%) of the study population. Seven (2%) females were breast feeding at the time of the study; hypothyroidism and hepatocellular cancer was present in 2 (0.7%) subjects (Table-1).

Overall, 225 (64%) were aware of the importance of vitamin D, whereas 126 (36%) were not; 246 (70%) knew about the role of vitamin D in normal bone development, and 105 (30%) did not know; 344 (98%) didn't know what was meant by fortified food containing vitamin D, while 168 (48%) experienced generalised body aches and pains and none of the patients had a fracture in the preceding one year.

Biochemical profile of the patients was also done (Table-2). Vitamin D3 levels were decreased in 291 (82.8%) subjects and the mean vitamin D3 level was 14.09 ± 12.93 ng/dL. Serum Calcium was 8.9 ± 0.7 mg/dL (normal range: 8.4-10.4 mg/dL), Serum Phosphorous was 4.1 ± 2.8 mg/dL (normal range: 2.6-4.4 mg/dL), and alkaline phosphatase was

Table-1: Demographic Data.

Gender	Female	62.9% (221)
	Male	37.1% (130)
Age (years)		46.03 ± 16.18
Residence	Islamabad	71.5% (251)
	Rawalpindi	7.3% (26)
	Abbottabad	2.0% (7)
	Peshawar	14.65 (51)
	Other areas	4.6% (16)
Weight (kg)		67.94 ± 14.77
Associated conditions		
Diabetes Mellitus Type-2	Present	9.3% (33)
	Not present	90.7%
Hypertension	Present	10.6% (37)
	Not present	89.4%
Malabsorption	Not present	100% (351)
Sun exposure	Decreased	45.7% (160)
	Not decreased	54.3%
Breast feeding	Breast feeding females	2% (7)
	Non-breast feeding females	98%
Parathyroid Disease	Absent	100% (251)
Thyroid Disease	Present	0.7%
	Not present	99.3%
Cancer	Present	0.7% (2)
	Not present	99.3%

Table-2: Laboratory Analysis.

Laboratory Investigations	Results	
Vitamin D3 levels	Decreased	82.8% (291)
	Normal	17.2%
Vitamin D3 levels		14.09 ± 12.93 ng/dL
Serum Calcium		8.9 ± 0.7 mg/dL
Serum Phosphorous		4.1 ± 2.8 mg/dL
Alkaline phosphatase		171.97 ± 100.6 U/L
Renal function tests	S. Creatinine	0.8 ± 0.1 mg/dL
	S. Urea	27.6 ± 8.7 mg/dL
Liver function tests	AST	28.2 ± 8.7 U/L
	ALT	30.7 ± 13.3 U/L
Blood complete picture	Haemoglobin	12.9 ± 1.8 g/dl
	Total leukocyte count	$7.9 \pm 1.1 \times 10^9$ /l
	Platelet count	$261,791 \pm 76,223 \times 10^9$ /l

AST: Aspartate aminotransferase. ALT: Alanine transaminase.

171.97 ± 100.6 U/L (normal range: 65-306 U/L). Renal function showed serum creatinine to be 0.8 ± 0.1 mg/dL (normal range: 0.7-1.19 mg/dL) and serum urea 27.6 ± 8.7 mg/dL (normal range: 10-50 mg/dL). Liver function tests showed aspartate aminotransferase (AST) to be 28.2 ± 8.7 U/L (normal up to 41 U/L) and alanine transaminase (ALT) 30.7 ± 13.3 U/L (normal up to 41 U/L). On blood complete picture (CP), haemoglobin was 12.9 ± 1.8 g/dl (normal range for females 11.5-16.5g/dl and males 13.0-18.0g/dl), total leukocyte count of $7.9 \pm 1.1 \times 10^9$ /l (normal range: $4.0-11.0 \times 10^9$ /l), and platelet count to be $261,791 \pm 76,223 \times 10^9$ /l (normal range: $150-400 \times 10^9$ /l).

Discussion

Vitamin D plays an important role throughout the body, including the development and calcification of the bones. Adequate exposure to sunlight and the use of dairy products with vitamin D have significantly reduced the incidence of vitamin D deficiency. However, vitamin D deficiency is still a common problem in many populations, particularly older adults.¹

Regarding vitamin D daily levels, it was difficult to have a rigid value for the whole world because of the regional, ethnic and genetic differences.² According to the clinical practice guidelines on vitamin D issued by the Endocrine Society, vitamin D deficiency has been defined as serum 25 hydroxy (OH) vitamin D levels less than 20ng/dL, whereas insufficiency constitutes serum 25(OH) vitamin D levels between 20ng/dL and 30ng/dL. Serum levels greater than 30ng/dL are deemed sufficient for children and adults.³ Recommendations for the daily intake for vitamin D for infants, children and adults are 200 IU (5µg) per day, for adults between 50-70 years, it is 400 IU.^{4,5}

In our study, we found that 82.8% had severe vitamin D deficiency keeping 20ng/ml as a cut off value. Only 17.2% had

higher values. A similar study conducted at a Karachi hospital showed that 92% of patients were D-deficient in ambulatory care setting, of which 62% had severe, 24% moderate and 8% had mild deficiency. Nearly half of all these patients (including those with severe deficiency) were asymptomatic.⁶ There are sporadic reports of D deficiency and sub-clinical osteomalacia from Pakistan till 2004 in pregnant and lactating women from Pakistan.² Recently low levels have been reported in out-patient department (OPD) patients from a public hospital in Karachi and in patients with hip fracture from Hazara District.⁷⁻⁹ In one study even urban population of Lahore coming from good socioeconomic setup had deficiency of vitamin D (86%; $p < 0.001$), and among the deficient, severe deficiency (66% of cumulative) was also significant at $p < 0.001$.¹ In studies in Saudi Arabia, the United Arab Emirates, Australia, Turkey, India and Lebanon, 30% to 50% of children and adults had 25-hydroxyvitamin D levels under 20ng/ml.² In another International study, 52% of Hispanic and black adolescents in a study in Boston¹⁰ and 48% of white pre-adolescent girls in a study in Maine had 25-OH vitamin D levels below 20ng/ml.¹¹

The two main sources of vitamin D are food and sunlight. Generally natural food sources have low vitamin D content and therefore require fortification. When food fortification is not enough, the major source of vitamin D is exposure to Ultra Violet B (UVB) rays in sunlight. UVB rays in sunlight are the primary source of Vitamin D. It is most intense between 10am and 3pm when the sunlight is brightest. Adequate amounts of vitamin D3 can be made in the skin after only 10 to 15 minutes of sun exposure at least two times per week to the face, arms, hands, or back without sunscreen.¹² In our study, only 54.3% had adequate sun exposure according to this definition of proper sun exposure, and 45.7% did not have adequate sun exposure. When full-day diet history was taken, it was revealed that only 33% used a glass of milk daily, cheese at least twice a week, and fish every two weeks, 98% didn't know what was meant by fortified food containing vitamin D ($p < 0.005$).

It is prudent to note by comparing studies mentioned above that in different regions of Pakistan, percentage of severe vitamin D deficiency levels are more or less in the same range but in contrast, the International studies show lesser rates. The difference might be due to different metabolism and genetics as well as food fortification in developed countries and good medical facilities with registering regular follow-up of patients regarding replacement therapy. Fortunately, Pakistan has adequate sunshine but on the other end of the spectrum, Pakistan does not have a mandatory vitamin D deficiency fortification policy in place.

The questions remain valid: are we not getting enough sun exposure, are we breaking down this vitamin more rapidly, or is there nutritional shortage of this vitamin?

Long-term vitamin D insufficiency/deficiency can cause secondary hyperparathyroidism and osteomalacia.¹³ Recent investigations have shown that parathyroid hormone (PTH) can serve as a functional biomarker of vitamin D deficiency.¹⁴ Without vitamin D, only 10% to 15% of dietary calcium and about 60% of phosphorus is absorbed.² We did not do PTH levels of our patients firstly because of non-affordability issues, and secondly our patients had normal calcium levels.

Conclusion

Undiagnosed vitamin D deficiency is prevalent in our setup. There is a need to determine the vitamin D status in the community. With the magnitude of deficiency that is seen in our population, fortification of food items is required. It is important to make physicians aware of the high prevalence of vitamin D deficiency in apparently healthy looking population. Measures for improving vitamin D status are needed to eradicate the existence of vitamin D deficiency.

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