

## SERUM VITAMIN D DEFICIENCY, A NEW EPIDEMIC.

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**ABSTRACT... Introduction:** Vitamin D deficiency has profound adverse effects on health. Serum calcium, phosphorus and even alkaline phosphatase cannot predict underlying vitamin D deficiency. **Objectives:** 1. To determine the frequency of vitamin D deficiency in outpatient private clinic 2. To determine the relation of vitamin D deficiency with the presenting symptom of bone or body aches. To see the relation of its deficiency to the serum calcium, alkaline phosphate and phosphate levels. **Study design:** Descriptive study. **Setting:** One of the local private clinic. **Materials and Methods:** 800 patients who presented to the clinic due to any ailment, having presenting complains with bone or body aches or not, were included in this study. The duration of study was 7 months from June to December 2008. **Results:** The study showed among total 33% (n=264) were male and 67% (n=536) were female. 33 patients (4.1%) were below age of 20 years, 364 patients (45.2%) were having age between 20-40 years, 252 (31.5%) were between 41-60 years, 143 (17.8%) were between 61-80 years and only 8 patients (1%) were above 80 years. Over all vitamin D present in sufficient amount (>30 ng/ml) in only 4 patients (0.5%), remaining patients (n=796, 99.5%) were deficient in vitamin D were further divided into those who were having deficiency (serum level <20 ng/ml) (n=636, 79%) and insufficiency (serum level between 21-29 ng/ml) (n=160, 20%). All the deficient patients were having normal serum calcium and phosphate levels and only 33 patients were having modestly raised serum alkaline phosphate. Among the sample only 318 (39.7%) were having bone or body aches as a presenting feature while remaining 482 (60.3%) were having no pains. More ever pain has got insignificant relation to any level of serum vitamin D level (p-value=0.201), however younger deficient patients were having lesser chance of bone or body aches as compared to age more then 60 year (p-value<0.001). **Conclusions:** Vitamin D deficiency is more prevalent in our community, as compared to published data, targeting young population. Vitamin D supplementation should be planned to decrease its varied and multidimensional ill effects on health.

**Key words:** Vitamin D, osteomalacia, Serum Calcium, Alkaline Phosphatase, Serum phosphate, Bones and body aches.

### INTRODUCTION

Vitamin D is formed in skin by ultra violet light and its dietary sources are egg yolk, oily fish, butter and milk<sup>22</sup>.

Amount of vitamin D is very small in dietary resources so normal levels of vitamin D depends upon ultraviolet

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sunlight exposure which permit formation of cholecalciferol from 7-dehydrocholesterol<sup>23,9</sup>. Vitamin D deficiency causes decrease in the intestinal absorption of calcium and bone growth<sup>8</sup>. The consequences of vitamin D deficiency upon the skeleton are well known<sup>5</sup>. In adults, prolonged deficiency of vitamin D (calciferol) can lead to osteomalacia<sup>6,25</sup> while lesser deficiency (insufficiency) is associated with various non-specific symptoms<sup>6</sup>.

There are three types of vitamin D deficiency: (1) primary vitamin D deficiency, which is due to a deficiency of vitamin D, the parent compound; (2) a deficiency of 1,25(OH)(2)D(3) resulting from decreased renal production of 1,25(OH)(2)D(3); and (3) resistance to 1,25(OH)(2)D(3) action owing to decreased responsiveness to 1, 25(OH)(2)D(3) of target tissues<sup>1</sup>.

Hypovitaminosis and vitamin D deficiency have been observed in developed and developing countries including several in the Middle East<sup>8</sup>. Many studies show high prevalence of vitamin D deficiency in Asian countries<sup>12</sup>. Significant vitamin D deficiency is present in 24.3% of postmenopausal female in United States and 12.5% in Italy. Institutionalized individuals are particularly at risk with incidence approaching 60%<sup>25</sup>.

Despite major contribution from sun ultra violet light it is surprising that rickets and osteomalacia, clinical presentations of vitamin D deficiency, remain common in tropical and subtropical countries. Skin pigmentation has negligible contribution in reduction of vitamin D formation from sunlight. Other environmental factors, the low calcium/high cereal diet typical of susceptible populations, might affect the efficiency of vitamin D utilization<sup>4</sup>. Avoidance of sunshine or inadequate intake of vitamin D<sup>8</sup> and malnutrition<sup>3</sup> may be the main causes.

There is increasing evidence that vitamin D insufficiency, by leading to sustained hyperparathyroidism, is prejudicial to the skeleton, particularly cortical bone, it is without symptoms until fractures occur<sup>5</sup>. There is also increased incidence of vitamin D deficiency in causation of tuberculosis<sup>11</sup>, it is part of the pathology of Alzheimer's, Parkinson's and some peripheral neuropathies including Restless legs syndrome. Vitamin D deficiency may also

be linked to an increased susceptibility to several chronic diseases such as high blood pressure<sup>16</sup>, cancer<sup>15</sup>, periodontal disease, multiple sclerosis, chronic pain, depression, schizophrenia, seasonal affective disorder<sup>17</sup>, peripheral artery disease<sup>17</sup> and several autoimmune diseases including type 1 diabetes<sup>18,19</sup>.

Because of high prevalence of vitamin D deficiency in Asia, as serum calcium and phosphorus levels do not predict exactly its deficiency<sup>11</sup>, and lack of data in this regard in Pakistan resulted in initiation of this study.

#### OPERATIONAL DEFINITION<sup>24</sup>

VITAMIN D DEFICIENCY: -	Less than 20 ng/ml.
VITAMIN D INSUFFICIENCY: -	21-29 ng/ml.
VITAMIN D SUFFICIENCY: -	Equal to or more than 30 ng/ml.
VITAMIN D INTOXICATION: -	More than 150 ng/ml.

#### DATA COLLECTION

The study was performed on 800 patients presented to a private clinic due to any disease; whether presentation was with or without bone or body aches, from June to December 2008. They were included in the study by their consent after proper explanation as cost of investigation was to be borne by patients.

Their serum calcium, phosphate, alkaline phosphatase and serum vitamin D level were measured by one of the most standardized laboratories of the country. The patients were also sorted according to sex and age and presentation with complaints of bone or body aches.

#### DATA ANALYSIS PROCEDURE

The study was analyzed on SPSS-Ver-10 for windows. In the study variables of interest were age, gender, serum calcium, phosphate, alkaline phosphatase, serum vitamin D levels and history of bone or body aches. Among epidemiological factors and vitamin D levels frequency (f) and percentage (%) was calculated. Relation of vitamin D and serum calcium, phosphate, alkaline phosphatase and symptom of bone or body aches was determined by using Fisher's exact test with p-value at 0.05 level of significance.

**RESULTS**

The results of the study were eye opener and were as under. Among total of 800 patients 33% (n=264) were male and 67% (n=536) were female. Among these 33 patients (4.1%) were below age of 20 year, 364 patients (45.6%) were having age between 20-40 year, 252 (31.5%) were between 41-60 year, 143 (17.8%) were between 61-80 year and 8 patients (1%) were above 80year (Table-I).

Over all vitamin D present in sufficient amount (>30 ng/ml) in only 4 patients, remaining patients were deficient in vitamin D (n=796 99.5%) were further divided into those who were having deficiency (serum level <20 ng/ml) (n=636, 79.5%) and those who were having insufficiency (serum level between 21-29 ng/ml) (n=160 20%) (Table I). Among these patient all were having normal serum calcium and phosphate levels and only 33 patients were having modestly elevated levels of alkaline phosphate (Table-II).

Age	Vitamin D levels (n)			Total
	<20ng/ml 79.5%	21-29ng/ml 20%	>30ng/ml 0.5%	
<20yrs	33	0	0	33
20-40yrs	285	79	0	364
41-60yrs	197	55	0	252
61-80yrs	121	22	0	143
>80yrs	0	4	4	8
Total	636	160	4	800

Among the sample patients only 318 (39.7%) were having bone or body aches as a presenting feature while predominant individuals 482 (60.3%) were having no pains (Table-II). More ever pain has got insignificant relation to any level of serum vitamin D level (p-value=0.201) (Table-II), however younger deficient patients were having lesser chance of bone or body aches as compared to age more then 60 year (p-value <0.001).

Vitamin D levels	Serum Ca levels		Serum Po <sub>4</sub> levels		Serum alkaline phosphate levels		Bones or body aches	
	8.6-10.5 mg/dl	<8.6 mg/dl	2.7-4.8 mg/dl	>4.8 mg/dl	27-132 mg/dl	>132 mg/dl	Yes* n=318(39.7%)	No** n=482(60.3%)
<20ng/ml n = 636	636	-	636	-	603	33	262	374
21-30 ng/ml n = 160	160	-	160	-	160	0	60	100
>30 ng/ml n = 4	04	-	04	-	04	0	0	04
Total	800	-	800	-	767	33	322	478
P-value	-		-		0.003		0.201	

\* = Bone or body pain was a presenting feature, \*\* = Bone or body pain was not a presenting feature.

Table-III.			
Age	Bones or body aches		Total
	Presentation	Was no presentation	
<20yrs	0	33	33
20-40yrs	67	297	364
41-60yrs	121	131	252
61-80yrs	122	21	143
>80yrs	04	04	08
Total	314	486	800
<i>P&lt;0.001</i>			

## DISCUSSION

Vitamin D deficiency is not an uncommon disease in the world; it has been widely reported in all age groups in recent years. Rickets has never been eradicated in developed countries as well<sup>7</sup>. Hypovitaminosis and vitamin D deficiency have observed been in developed and developing countries including several in the Middle East<sup>8</sup>.

Vitamin D is important for calcium absorption and bone growth<sup>8</sup>. Beside diseases of bones it has wide range of health implications; early life vitamin D inadequacy is a causative factor in development of certain autoimmune disease<sup>7,18,19</sup> like type 1 diabetes<sup>18,19</sup>, rheumatoid arthritis<sup>14</sup> and certain cancers later in life<sup>7</sup>. Vitamin D deficiency exists in patients with tuberculosis and it is possibly a cause rather than effect of the disease<sup>11</sup>. It is part of the pathology of Alzheimer's, Parkinson's and some peripheral neuropathies including Restless legs syndrome<sup>17</sup>. Vitamin D deficiency may also be linked to an increased susceptibility to several chronic diseases such as high blood pressure<sup>16</sup>, periodontal disease, multiple sclerosis<sup>14</sup>, chronic pain, depression, schizophrenia, seasonal affective disorder, peripheral artery disease<sup>17</sup>.

As data of adult Pakistani population, as far as deficiency of vitamin D is concerned, is lacking so this study was performed to determine the frequency of vitamin D

deficiency in out patient clinic, its relation to presenting symptom of bones or body aches and to the serum level of calcium, phosphate and alkaline phosphatase.

The study showed very high frequency of vitamin D deficiency in Pakistani population in month of July; peak summer season in Faisalabad. Deficiency recorded in our study in sample population was 99.5% (79% deficient and 20% were having insufficient levels). These results are out of proportion to the existing international data, showing 14.5% in U.K reaching to more than 30% in age above 65 year<sup>6</sup>, 24.3% in United States<sup>25</sup>, 12.5% in Italy<sup>25</sup>, 55% in Irish females<sup>20</sup> and 83% in Saudi Arabia<sup>2</sup>. Possible factors may be due to decreased intake or lack of sun exposure due to social or religious reasons<sup>13</sup>.

Vitamin D deficiency is not the most important risk factors for hip fractures, but the easiest to correct<sup>10</sup>. Vitamin D deficiency is common in the elderly, especially in patients with hip fracture. Elderly people infrequently stay outside in the sunshine, and nutrition is deficient in vitamin D<sup>10</sup>. The results of the present study were different to the mentioned international data as in this study there were only 151 (19.2%) patient were above age 60 year remaining 649 (80.8%) patients were below 60 year of age and all were deficient in vitamin D. This difference perhaps may be due to the fact that predominate population presented in the study time to the clinic was below 60 year, whoever, vitamin D deficiency in less than 60 year age group is really eye opener.

Vitamin D deficiency can occur without any symptoms. If symptoms are present, it indicates severe deficiency<sup>11</sup>. Same thing is also seen in this study, only 39.7% patient were having bones or body aches on presentation while remaining 60.3% were having no complains showing insignificant relation between deficiency and symptoms (p-value= 0.201). Hence, the idea that musculoskeletal pains are directly associated with vitamin D deficiency<sup>13</sup> is not matched to the results of our study. However, young deficient patient were having lesser chances of having bones or body aches as compared to the above 60 year population (p-value<0.001).

This study also confirms the fact mentioned in international literature that vitamin deficiency have no relation to the serum calcium, phosphate and alkaline phosphatase levels<sup>11</sup>. In this study all the deficient population was having normal serum calcium, phosphate, while only 33 patient were having modestly elevated levels.

All this discussion approves the fact that Vitamin D is much more prevalent in this part of the world emphasizing the importance of health education and supplementation of this vitamin<sup>21</sup> to reduce wide range of ill effects it produce on health.

### LIMITATION OF THE STUDY

Number of patients in this study is very small nevertheless it may be taken as an ignition to conduct more research work to detect this important health issue and to prevent all the ill effect produced by its deficiency.

### CONCLUSION

Vitamin D deficiency is much more prevalent in our community as compared to published western data, particularly young population is more suffering to this new endemic, more ever often it is asymptomatic and also serum calcium, phosphate and alkaline phosphatase levels are not predictable indicators of its underlying deficiency. So mass level screening and vitamin D supplementation should be planned to decrease its varied and multidimensional ill effects on health.

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**What you are is God's  
gift to you, what you  
make of yourself is  
your gift to God.**

Kelly Jeppesen