Evaluation of vitamin D levels in osteoporotic patients

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Abstract

Background: High prevalence of Vitamin D insufficiency in healthy population has been reported worldwide in the past few years. Vitamin D inadequacy is defined by “low serum 25-hydroxyvitamin D (25[OH]D), the major circulating form of Vitamin D and standard indicator of Vitamin D status” [1]. In 1994, the WHO defined osteoporosis as “disease characterized by low bone mass and micro-architectural deterioration of bone tissue, enhanced bone fragility and an increase in fracture risk” [2]. Female sex, and increasing age are some of the non-modifiable risk factors, [3] and however vitamin D deficiency, smoking, physical inactivity and low body mass index (BMI), are modifiable risk factors associated with it [4].

Aim: To measure vitamin-D and BMD levels in elderly population > 60 years of age and find out a association between them.

Methods: Subjects >60 years of age, without any chronic illness were recruited and subjected to undergo DEXA scan for BMD analysis and serum Vitamin D levels using Elisa technique. The relationship between the variables were carried out using fisher exact test using SPSS software.

Results: Of the total 110 patients, Only 26.4% of subjects had sufficient vitamin D levels, while 70.9% had insufficient and 2.7% had deficient vitamin D levels. Only 2.7% of subjects had normal BMD levels, while 36.4% had osteopenia and 60.9% had osteoporosis. There was No significant association between vitamin D and BMD levels (p=0.506).

Conclusion: No significant association was found between levels of Vitamin D and BMD.

Keywords: osteoporosis, vitamin D, BMD

Introduction

High prevalence of Vitamin D insufficiency in healthy population has been reported worldwide in the past few years. Vitamin D inadequacy is defined by “low serum 25-hydroxyvitamin D (25[OH]D), the major circulating form of Vitamin D and standard indicator of Vitamin D status” [1].

In 1994, the WHO defined osteoporosis as “disease characterized by low bone mass and micro-architectural deterioration of bone tissue, enhanced bone fragility and an increase in fracture risk” [2]. Female sex, and increasing age are some of the non-modifiable risk factors, [3] and however vitamin D deficiency, smoking, physical inactivity and low body mass index (BMI), are modifiable risk factors associated with it [4].

Despite proof of its hazards to human health, Physicians fails to recognize Vitamin D insufficiency and Osteoporosis as a problem, the study was done With Aim to measure vitamin-D levels in osteoporotic patients > 60 years of age and find out association between them.

Materials and Methods

The study was conducted in Himalayan Institute of medical sciences in 110 Subjects >60 years of age, without any chronic illness who were Subjected to having a detailed Questionnaire on their personal habits and life style behaviors and thereafter all the subjected underwent DEXA scan for BMD analysis and serum Vitamin D levels using Elisa technique. The relationship between the variables were carried out using fisher exact test using SPSS software.

Bone mineral density (BMD) measurement using dual energy X-ray absorptiometry (DEXA) is a” gold-standard” for diagnosing osteoporosis and risk of fragility fractures.
The BMD is calculated as “T-score, which is the number of standard deviations above or below the mean BMD for normal young adults” and is interpreted as:

- Normal BMD: “T-score < -1 SD below the young adult mean”
- Osteopenia: “T-score between -1.0 and -2.5”
- Osteoporosis: “T-score equal to or < -2.5”
- Severe osteoporosis: T-score < -2.5 for patients with a fragility fracture (5).

Vitamin D levels are categorized by US National Osteoporosis foundation as follows:

- Normal: 75-250 nmol/L
- Insufficient: 25-74 nmol/L
- Deficient: <25 nmol/L
- Toxic: >250 nmol/L

Results

Figure 1: Age distribution of the study subjects

A total of 110 subjects aged >60 years were taken in this study. 69.1 years was the mean age of these subjects.

Figure 2: Distribution of vitamin D level in the study subjects

Figure 7 shows the distribution of vitamin D levels in the study population. Only 26.4% of subjects had sufficient vitamin D3 level, while 70.9% had insufficient and 2.7% had deficient vitamin D level.

Table 1: Association between vitamin D and BMD level in the study subjects

<table>
<thead>
<tr>
<th>BMD</th>
<th>Vitamin D</th>
<th>Total</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deficient</td>
<td>Insufficient</td>
<td>Sufficient</td>
</tr>
<tr>
<td>Normal</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Osteopenia</td>
<td>1 (2.5%)</td>
<td>25 (62.5%)</td>
<td>14 (35%)</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>2 (3.0%)</td>
<td>50 (74.6%)</td>
<td>15 (22.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>78</td>
<td>29</td>
</tr>
</tbody>
</table>

There was no significant association between BMD and vitamin D levels (p=0.506). All the subjects with Normal BMD were found to be having insufficient vitamin D levels, although almost 74% of the osteoporotic/osteopenic subjects had insufficient/deficient vitamin D levels, but this was not-significant on statistical analysis.

Discussion

In our study 26% of subjects had sufficient vitamin D level, while 71% had insufficient and 3% had deficient levels of vitamin D. The higher prevalence of levels of vitamin D deficiencies reported in our study is consistent with those reported in the reviewed literature. Palacios C et al. [6] showed that levels of vitamin D deficiency was prevalent among apparently healthy elders ranged from 60% to 95% across different countries around the globe. Similarly, Ritu et al. [7] showed that levels of vitamin D deficiencies’s prevalence ranged between 50%-95% among ostensibly healthy individuals. Meanwhile 94.3% subjects had vitamin D level <20 ng/mL in a cross-sectional study conducted in Delhi by Vuppuru et al., [8] among 105 subjects with mean age of 43.3 years. Similarly, another study by Marwaha et al. [9] among 1,346 subjects, 91.2% subjects had vitamin D level <20 ng/mL.

In our study, the majority of the study subjects had either osteopenia or osteoporosis. Only 3% of subjects had normal BMD level, while 36% had osteopenia and 61% had osteoporosis. A wide variations have been reported in the prevalence of osteoporosis/osteopenia in the reviewed literature. Our study results are consistent with those done by Hemalata et al. [10] and Kaushal et al. [11]. Hemalata et al., reported higher prevalence of osteoporosis (50%) and osteopenia (36%) in persons aged >50 years. However disparity in results with Agarwal et al. [12] can be because study done by Agarwal et al., include only male population, while our study included both Males and females. In this study, we did not find any statistical association between...
BMD and vitamin D levels which is consistent with other studies who have reported that there is no correlation of BMD and Vitamin D levels [Ritu et al. [7], Marwaha et al [9] and Kaushal et al. [11] i.e. the prevalence of low BMD (osteopenia/osteoporosis) was irrespective of the vitamin D level.

Vitamin D is essential factor responsible for calcium uptake but there is no association in BMD and Vitamin D level of patients. Ritu et al. [7] in a narrative review of different publications across India reported that vitamin D status correlated positively with BMD in few studies, however No correlation was found with levels BMD with levels of vitamin D status in most studies. In a study done by Agarwal et al. [12] among 200 adults, reported that those with vitamin D level >22 ng/mL had normal mean BMD at hip, femur neck, and trochanter, but In another study by Marwaha et al., [9] 2011 conducted in Delhi reported no correlation between levels of BMD and levels of vitamin D.

**Conclusion**

- Only 26.4% of subjects had sufficient vitamin D3 level, while 70.9% had insufficient and 2.7% had deficient vitamin D3 level
- Only 2.7% of subjects had normal BMD levels, while 36.4% had osteopenia and 60.9% had osteoporosis
- On Statistical analysis no significant association was found between levels of vitamin D and BMD level

**References**