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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- : >250nmol/l

Results

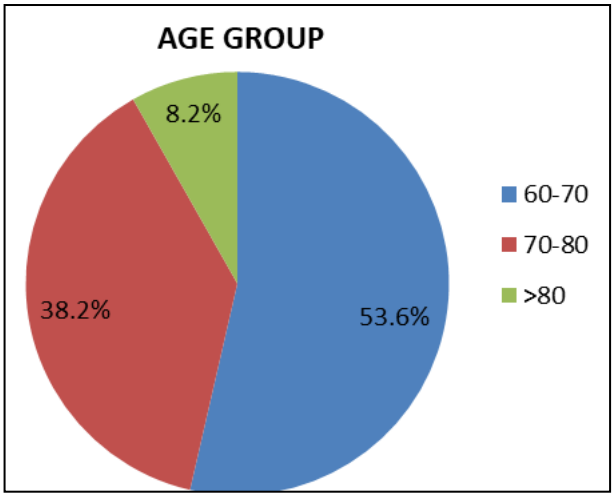

Fig 1: Age distribution of the study subjects

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

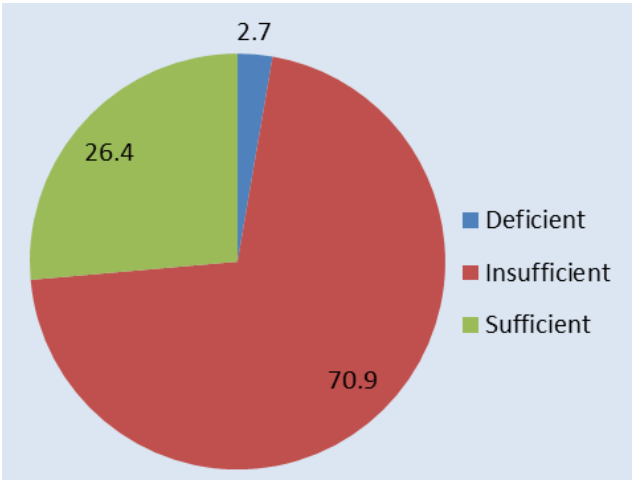

Fig 2: Distribution of vitamin D level in the study subjects

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

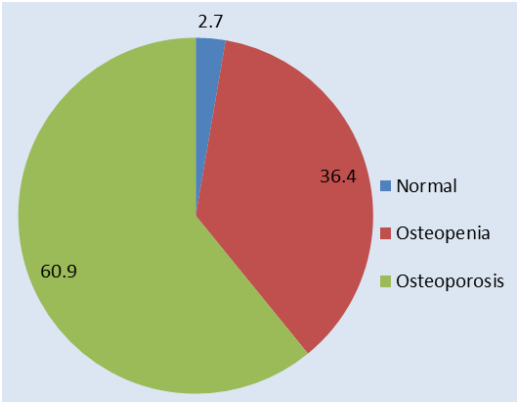

Fig 3: Distribution of BMD level in the study subjects

Figure 8 depicts the distribution of BMD levels in study population. Only 2.7% of subjects had normal BMD levels, while 36.4% had osteopenia and 60.9% had osteoporosis.

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

BMD	Vitamin D			Total	P
	Deficient	Insufficient	Sufficient		
Normal	0 (0%)	3 (100%)	0 (0%)	3 (2.7%)	0.506
Osteopenia	1 (2.5%)	25 (62.5%)	14 (35%)	40 (36.4%)	
Osteoporosis	2 (3.0%)	50 (74.6%)	15 (22.4%)	67 (60.9%)	
Total	3	78	29	110	

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 prevelance 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 Vupputuri *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

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