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An Evaluation to measurement Vitamin D Levels and Relationship with Bone Mineral Density in Patients at tertiary care hospital

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Abstract

Introduction: An Osteoporosis, the most common bone disease in humans, is a serious public health problem. Aged persons, women, and Caucasians are more liable to have it. Osteoporosis is a risk factor for fractures, just as high blood pressure. Millions of individuals of all ages and ethnicities suffer from osteoporosis, and as the population ages, its prevalence will escalate.

Aims & Objectives: To know the Vitamin D levels of patients belonging 45 to 80 years and its correlation with Bone Mineral Density.

Methods: This study was conducted at a tertiary care hospital over a period of one year in 62 patients (45 to 80 age) and analysed for vitamin D levels and correlated with osteoporosis mineral density scores.

Results: The mean age of patients in this study was 63.71±9.41yrs [58.1% were female and 41.9% male patients]. Vitamin D deficiency was seen in 54.8% of patients with 62.9% having osteoporosis and 30.6% having Osteopenia. There is a significant association of Vitamin D levels and lower sun light exposures, female gender, T-score changes, socio-economic status and BMI of the patients ($p<0.05$).

Conclusion: 54.8% of individuals older than 45 years, of both sexes, had deficiency of vitamin D. Significantly, individuals' BMI and T-scores at the spine

and femur were positively correlated with vitamin D levels. Compared to men, women have a significantly higher incidence of osteoporosis. The T scores averaged 65.4% at spine and 69.2% at femur in females, and 61.1% at spine and 47.2% at femur in males.

Keyword: Hypovitaminosis, Vitamin D, Postmenopausal, Deficiencies, Anticonvulsants.

Introduction

Osteoporosis is characterised by change in bone mineral density [BMD] and with low T scores it has high risk of fractures. T scores have an important role in prediction of fractures and guide Orthopaedic surgical and non-surgical treatment. Since last century osteoporosis is a serious public health problem in the elderly and in the other age groups also. If it is associated with concomitant lower Vitamin D levels, and other causes like menopause or related conditions like osteopenia with lower vitamin D levels, obesity and low exposure to sunlight in current social economic conditions. Contemporary osteoporosis treatment needs multidirectional approach.

As per clinico-laboratory parameters the metabolised form of vitamin D 1,25[OH]2D and its effect in calcium absorption and renal uptake is well established. Hence these levels are routinely checked in Orthopaedic clinics along with DEXA scans in the suspected and even in established osteoporosis.

It is estimated that osteoporotic hip fractures affect more than 200 million people worldwide. According to some studies, 40% of women who are postmenopausal and 30% of men are anticipated to sustain an osteoporotic fracture over the course of their careers, and 30% of women in both Europe and the United States are estimated to be osteoporotic, which is characterised by decreased bone mass and degradation of bone architecture, is on increasing prevalence among women. Despite the fact that data on the prevalence of osteoporosis among women come from small-group research. As of 2023, osteoporosis is a significant public health issue for women. Low calcium intake, a high incidence of vitamin D deficiency, growing longevity, sex asymmetry, perimenopause, a lack of tools for diagnosis, and a paucity of health awareness for women are all contributing to the high prevalence of osteoporosis.

Despite having ample of sunshine, revealed a vitamin D deficiency in people of all ages. Some causes of hypovitaminosis D include limiting exposure to sunlight due to sociocultural norms, not getting adequate amounts of calcium, environmental degradation, and a higher 25(OH)-d-24-hydroxylase enzyme amongst Patients.

The intention of the present study was to investigate the occurrence of deficiencies in vitamin D in those over the age of 45 and the correlation between it and the density of bone minerals (BMD) in both the male and female population.

Materials and Methods

Study Designs and Subjects: Patients over the age of 45 who visited at tertiary care hospital. The patients who were all excluded met the outlined criterion. Patients exceeding the age of 80, those with substantial liver disease, altered kidney activity, or a history of cancer, those taking steroid medication, anticonvulsants, or blood thinners.

Procedure

Following the granting of informed consents, information regarding the risk factors for low vitamin D levels was obtained, and patients carried DEXA scans to determine the density of their bones [BMD] status.

Based on BMD values and the WHO guidelines, the T score was identified as osteoporosis and osteopenia.

BMD was determined using DEXA results and took into account the lumbar spine, right hip, and left hip.

Chemiluminescent test was used for determining serum Vitamin D levels, and spectrophotometric evaluation of blood samples was used to determine other biochemical variables.

Sunlight exposure: more than two hours per day was deemed adequate whereas less than two hours per day was deemed inadequate, and this was documented as per patients' history during the time of fulfilling inclusion /exclusion criteria at the time of admission /OPD consultations for all 62 patients.

DEXA scanning technique

It involved exposing the body to barely any X-ray radiation. The lumbar region and both of the hips were the focal points of the scans.

Interpretation

The "T" or "Z" score and bone mineral density (measured in gm/cm2) were calculated. The BMD result is compared with people in the same group of ages, size, and gender using the "Z" score. A young adult of the identical gender with a high bone mass peak is compared to the BMD data using the "T" score.

The BMD procedure employed was the following:

- When T Score is within one SD of the adult mean, a BMD is considered normal.
- The T score ranges for osteopenia is -1.0 to -2.5.
- A T-score of minus 2.5 or down below, either with or without a fragile fracture, indicates osteoporosis.

A diagnosis was made using BMD data. Relationships were then inferred from data on various additional risk factors that were collected through the questionnaire, correlated, and analysis.

Analysis and Results of Statistics

The comparison was represented using the appropriate graphs. Analysis was conducted using SPSS v21 running on Windows 10 and the value of p below five percent (0.05) was taken to be significant for all tests.

Results

In the 62 patients the mean age was 63.71±9.41yrs. 58.1% were female patients and 41.9% male patients. Vitamin D was low in 54.8%. Among them 62.9% had osteoporosis and 30.6% had Osteopenia. Patients who were vegetarians had a higher frequency of vitamin D deficiency than patients who were non vegetarians (35.3% vs. 64.7%). ($p<0.05$).

Regarding spine T score, 39 patients had osteoporosis and 23 patients [30.6%] had osteopenia and normal findings. With femur T scores, in 35 patients [56.5%] showed osteoporosis and [29.0%] 18 patients had osteopenia and in 9 patient's normal findings were seen. Also, significant association [$p<0.05$] was observed with inadequate Vitamin D levels and lower sun light exposure in 38 patients as female gender, T-score changes, socio-economic status and BMI of the patients as in ($p<0.05$).

Discussion

In the 62 patients studied 35.5% belonged to lower socioeconomic status, 33.9% in upper class and 30.6% in middle socioeconomic status. Similarly, in the occupational division we observed half of the patients [56.5%] were having occupation of sedentary lifestyle while 43.5% were laborer's and others. Thus, our study has almost equal representation from all socioeconomic groups/strata.

In our study 59.7% were vegetarian and 40.3% were non-vegetarian or consumed mixed diet. In these 35.3% non-vegetarians, they had vitamin D deficiency

compared with 64.7% vegetarians. Yet we couldn't conclusively derive statistical significance relating to cause of vitamin D deficiency and dietary habits.

When estimating sunlight exposure, 37.1 percent of the patients had sufficient exposure, whereas 62.9% had insufficient exposure. and this was associated with low levels of vitamin D. Patients who were lacking enough vitamin D and a sufficient amount of sunlight had higher rates of osteoporosis and osteopenia ($p<0.05$).

Comparing the data to those from prior studies, which includes an investigation conducted in 2008 by Paul TV et al.12 to determine the rate of osteoporosis among postmenopausal women, they found a frequency of 50 percent overall, of which 48 percent was in the lumbar spine, and a percentage of 16.7 in the neck of the femur, whereas 61.1 percent of men and 65.4 percent of women in our study, respectively. Additionally, they compared their spinal T-score between the genders and the age distribution of the individuals who participated in their study, there was higher incidence of osteoporosis and Osteopenia among the patients in age 56-75yrs which is similar to our study but for different age group of 45 to 80 years. Patients with low vitamin D levels had osteoporosis on their spine T-scores, which was more pronounced in female patients than in male patients.

In our study among 36 women, 34 were postmenopausal and 92 percent among them had vitamin D deficiency. In present study on assessment of Pearson's correlation, study found significant positive strength of association of vitamin D level with BMI, Spine T-score and femur T-score of patients ($p<0.05$).

When compared geographically in study 53 percent had vitamin D insufficiency. While our study had most of the sample size 54.8 percentage had vitamin D insufficiency (67.3percent) had levels below 20 ngm/ml.

These observations suggest occurrence of vitamin D insufficiency in more than half of the population above the age of 45 and the necessity for dietary or therapeutic interventions.

Conclusion

In the elderly patients Vitamin D levels are relatively low with higher occurrence of osteoporosis reflected in T score values. Also Sr. Alkaline phosphatase levels were comparatively higher in this groups. It is essential to look into these three parameters in the elderly populations. Thus, in the lower and non-affordable groups it may be suggested to look into serum alkaline phosphatase levels before the assessment of vitamin D levels.

54.8% of those older than 45 years were found to be deficient in vitamin D. The subjects' BMI and the T-score at the spine and femur were strongly positively related with the vitamin D levels. Females were shown to have a significantly higher incidence of osteoporosis than males, 61.1 percent at the spine and 47.2 percent at the femur in men, and 65.4% at the spine and 69.2 percent at the femur in women. Along with poor sun exposure, low vitamin D levels, patients' BMIs, diets, and socioeconomic status, a significant connection between osteoporosis and all of these variables was also found. The study also suggested that in middle age people even though T score values were not suggestive of osteoporosis, they certainly had lower levels of vitamin D. These findings highlight necessity for adequate consumption of vitamin D, proper sunlight exposure and avoid neglect to simple measures so as to decrease the risk of weak bones and osteoporosis.

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