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ANALYSIS OF VITAMIN D LEVELS WITH BONE DENSITY AND ALKALINE PHOSPHATASE IN WOMEN

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Abstract:

Introduction: *Vitamin D deficiency causes defects of bone mineralization and low vitamin D status has been detected in patients with hip fractures.* ***Aims and objectives:*** *The basic aim of the study is to analyse the vitamin D levels with bone density and alkaline phosphatase in women.* ***Material and methods:*** *This cross sectional study was conducted in Services hospital, Lahore during November 2018 to March 2019. The data was collected from 100 patients. Patients with hyperparathyroidism, Paget's bone disease, or secondary osteoporosis were not included in the study. All clinically suspected cases of osteopenia and osteoporosis with age >40 years were included in this study. The data were collected through a questionnaire in which we add all the demographic values of selected patients.* ***Results:*** *The data was collected from 100 individuals. There was no significant correlation (P = 0.09) between values for 25-OHD and 25-$(OH)_2$ D. Ten per cent of the women (n = 50) had serum 25-OHD levels below 12 ng mL. This subgroup also had significantly lower serum 25-$(OH)_2$D (24.9 vs. 27.9 pg mL, P , 0.05), but they did not differ from the rest with regard to PTH and P-calcium levels.* ***Conclusion****: It is concluded that vitamin D deficiency causes bone loss and increased bone turnover and, therefore, vitamin D status should be assessed and corrected in populations at risk.*

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INTRODUCTION:

Vitamin D deficiency causes defects of bone mineralization and low vitamin D status has been detected in patients with hip fractures. While in the past it was thought that vitamin D deficiency affects mostly northern countries and where there is a restricted exposure to sunlight or in elderly patients, other studies have shown that vitamin D deficiency may be common also in subtropical countries or southern Europe including Italy [1]. In a large clinical trial on raloxifene, it was found that a vitamin D deficiency is common in southern Europe (8.3% of the patients). In the same study, 24.3% of the postmenopausal women had low-normal vitamin D status, in a range that could be considered partial vitamin D deficiency [2].

Osteoporosis is a serious, worldwide, and growing health problem; WHO has estimated the 30% of all women, older than 50 years (post-menopausal) has osteoporosis. Osteoporosis is a skeletal disorder characterized by compromised bone strength predisposing a person to an increased risk of fracture [3]. Bone strength reflects the integration of two main features: bone density and bone quality. Vitamin D plays a key role in homeostasis as well as regulation of body functions and its deficiency has been associated with different disorders [4]. Vitamin D deficiency is reported in different age brackets and in different age groups, like newborns, toddlers, pregnant women, adolescents, and elderly males from different countries. The common risk factors of vitamin D deficiency are poverty, not taking proper diet, poor calcium intake, dark pigmented skin, avoiding sunlight and social norms such as indoor living. It has been reported that despite abundance of sunlight in South Asia, there is vitamin D insufficiency [5]. The deficiency of vitamin D is a public health issue in Pakistan and its prevalence in different areas of Pakistan ranges from 70% to 90% in healthy asymptomatic volunteers, while 92-97% deficiency was reported in ambulatory patients. Insufficient vitamin D results in increased bone loss and low bone mineral density (BMD) as well as osteoporosis. However, it was shown that vitamin D deficiency has no direct impact on BMD [3].

Vitamin D metabolites participate in the regulation of calcium homeostasis and bone metabolism. Their role in determining bone mass, however, is still not clear. It is well known that severe and prolonged vitamin D deficiency causes osteomalacia. Subclinical vitamin D deficiency is common in the elderly and may lead to development of secondary hyperparathyroidism and bone loss, for which reason it has been implicated in the pathogenesis of senile osteoporosis [6].

Aims and objectives

The basic aim of the study is to analyse the vitamin D levels with bone density and alkaline phosphatase in women.

MATERIAL AND METHODS:

This cross sectional study was conducted in Services hospital, Lahore during November 2018 to March 2019. The data was collected from 100 patients. Patients with hyperparathyroidism, Paget's bone disease, or secondary osteoporosis were not included in the study. All clinically suspected cases of osteopenia and osteoporosis with age >40 years were included in this study. The data were collected through a questionnaire in which we add all the demographic values of selected patients. Biochemical tests performed included alkaline phosphatase (ALP), serum calcium, serum phosphorus, and 25 hydroxy vitamin D(25[OH]D). Serum phosphorous, calcium and ALP were determined by spectrophotometric method, while 25(OH)D was determined by using radioimmunoassay method. 25OHD was measured using enzyme-linked immunosorbent assay (ELISA) using materials provided by Immunodiagnostic Systems.

Statistical analysis

The data were collected and analysed using SPSS version 19.0. All the values were expressed in mean and standard deviation.

RESULTS:

The data was collected from 100 individuals. There was no significant correlation (P = 0.09) between values for 25-OHD and 25-$(OH)_2$ D. Ten per cent of the women (n = 50) had serum 25-OHD levels below 12 ng mL. This subgroup also had significantly lower serum 25-$(OH)_2$D (24.9 vs. 27.9 pg mL, P , 0.05), but they did not differ from the rest with regard to PTH and P-calcium levels.

Table 01: Biochemical markers of subjects subdivided three times into two groups on the basis of the different 25OHD cut off values

	Cutoff at 20 ng/mL		Cutoff at 25 ng/mL	
	25OHD >20 ng/mL	**25OHD <20 ng/mL**	**25OHD >25 ng/mL**	**25OHD <25 ng/mL**
Age (years)	57.6 ± 6.4	57.1 ± 6.0	56.6 ± 5.5	57.8 ± 6.2
BMI (Kg/m^2)	26.6 ± 4.4	27.0 ± 3.5	25.9 ± 3.7	27.4 ± 4.1
Lumbar (L1–L4) *T*-score	−1.9 ± 1.3**	−2.2 ± 1.3	−1.7 ± 1.3**	−2.2 ± 1.6
Femoral neck *T*-score	−1.2 ± 1.0**	−1.8 ± 1.0	−1.3 ± 1.2**	−1.5 ± 1.0
Osteocalcin (ng/mL)	18.8 ± 12.2	20.5 ± 12.1	18.2 ± 12.3	20.1 ± 11.6
BAP (μg/mL)	20.2 ± 7.4**	23.1 ± 8.4	19.3 ± 6.6**	23.0 ± 7.1
CTX (pmol/L)	4426.2 ± 3546.9*	5439.5 ± 3143.0	4105.3 ± 2162.7*	5324 ± 3395
PTH (pg/mL)	22.2 ± 15.6**	35.5 ± 18.5	20.0 ± 15.8**	33.3 ± 16.4
25OHD (ng/mL)	30.2 ± 8.8**	14.4 ± 3.6	33.1 ± 8.6**	16.8 ± 7.8

DISCUSSION:

Dark skin colour was a significant risk factor associated with vitamin D insufficiency which is consistent with the studies conducted in South Asia. The BMD examination showed that almost half of the study population had a normal bone minerals level. But on the other hand, one quarter had osteopenia and other quarter had osteoporosis, indicating that almost half of the population is on the risk of bone fracture [7]. Osteopenia and osteoporosis were common among females, especially of old age. This was consistent with a previous study. Our study findings showed no correlation between vitamin D levels with the BMD, which is similar to the findings reported by others. Studies have also reported a positive association between vitamin D levels and BMD at the hip and spine in men and women [8]. Another study from India on healthy individuals also reported similar results. However, this is contradictory to the findings from the same population of South Asian women living in the United Kingdom where serum 25(OH)D deficiency was associated with a progressive reduction in bone mass [9]. Moreover, impaired vitamin D status has been generally associated with an increased risk of fractures. A nested case control study from the Women's Health Initiative showed a near doubling of the odds ratio of risk for hip fracture in subjects with 25OHD lower than 20 ng/mL [10].

CONCLUSION:

It is concluded that vitamin D deficiency causes bone loss and increased bone turnover and, therefore, vitamin D status should be assessed and corrected in populations at risk.

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