

## Vitamin D deficiency associated comorbidities - A study from Vadodara, India

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### ABSTRACT

**Background:** Vitamin-D deficiency is an unrecognized epidemic across the world. It is associated with increased risk of common cancers, autoimmune diseases, hypertension, and infectious diseases.

**Aim:** To assess the Vitamin D deficiency related comorbidities.

**Method:** In this prospective study, a cohort of 100 consecutively referred vitamin-D deficiency cases was studied. Demographic profile, medical conditions for which they were getting investigated, results of investigations and additional information from their hospital records were analyzed.

**Results:** Out of 100 cases analyzed (53) were female, 48% belonging to age-group of 25-49 years. 92% cases were from urban areas. 53% cases were investigated for vitamin-D assay after more than 3 contacts with their physicians. Musculoskeletal ailments were common complaints in males, and osteoporosis and anaemia in females. Average Vit-D levels for history of recurrent fractures, suspicion of carcinoma, osteoporosis, anaemia and muscle pain were 4, 4.8, 5.1, 5.6 and 6 ng/ml respectively.

**Conclusion:** Associated comorbidities with Vit-D deficiencies include musculoskeletal disorder and anaemia. Suspicion level among clinicians for this disorder cases also appears abysmally low.

**Key words:** vitamin D deficiency, anaemia, musculoskeletal disorders, osteoporosis

### INTRODUCTION

Vitamin D (Vit-D) is a fat soluble steroid pro-hormone mainly produced photochemically in the skin from 7-dehydrocholesterol. Most humans depend on sun exposure to meet its requirements. Solar ultraviolet B photons are absorbed by 7-dehydrocholesterol in the skin, leading to its transformation to previtamin D<sub>3</sub>, which is rapidly converted to vitamin D<sub>3</sub>. Once formed, vitamin D<sub>3</sub> is metabolized in the liver to 25-hydroxyvitamin D<sub>3</sub> and then in the kidney to its biologically active form, 1, 25-dihydroxyvitamin D<sub>3</sub>.<sup>1</sup> Season, latitude, time of day, skin pigmentation, aging and sunscreen use influence the cutaneous production of vitamin D<sub>3</sub>. Very few foods naturally contain vitamin D, and foods that are fortified with vitamin D are often inadequate to meet its daily requirements. Vit-D deficiency causes rickets in children and will precipitate and exacerbate osteopenia, osteoporosis, and fractures in adults. Vitamin D deficiency has been associated with increased risk of common cancers, autoimmune diseases, hypertension, and infectious diseases.<sup>1</sup> In a recently conducted randomized controlled trial, it was established that a daily ingestion of 1100 IU of

colecalfiferol (vitamin D) over a 4-year period dramatically reduces the incidence of non-skin cancers.<sup>2</sup>

Vit-D deficiency is an unrecognized epidemic among all age groups throughout the world, and is now recognized as a pandemic.<sup>3</sup> It has been estimated that worldwide about 1 billion people have Vit-D deficiency.<sup>4</sup> Studies from India also report a widespread prevalence of varying degrees of Vit-D deficiency.<sup>5,6</sup>

Although the causes of Vitamin D deficiency are well known, its prevention is far from expectation. Although, there is adequate sunshine in India; high temperatures along with sultry and humid climate in many areas are hindrance to prophylaxis against Vit-D deficiency.<sup>6</sup>

In India, data to substantiate the magnitude of the burden of Vit-D deficiency and its association with various medical disorders is scarce. Therefore the present study was carried out with the objective of assessing vitamin D levels in various aforementioned illnesses in order to have a better idea for future clinico-nutritional guidance.

## METHODOLOGY

The present study was record-based prospective design conducted from April to June 2012. A cohort of 100 cases referred to and subsequently investigated for Vitamin D levels and diagnosed as deficient for the same was taken as the study sample. Purposive sampling was done due to unavailability of substantial data in the western region of India pertaining to this study.

Vit-D was measured as 25-OH Vit-D on Architect I 2000 (ABBOTT) based on Chemiluminescent Micro particle Immunoassay (CMIA) from human serum and plasma. The manufacturer recommended reference range of 9.4-52.4 ng/ml for males and 9.4-59.4 ng/ml for females.<sup>7</sup> Seasonal variation based on exposure to sunlight is likely and hence a target range of 30-40 ng/ml was considered as baselines for the purpose of this study.

The records were converted into anonymous sheets and confidentiality of the study subjects was maintained at all the levels of the research. Informed consent was taken from the study participants. Ethical clearance was obtained from the Institutional Ethics Committee.

## RESULTS

Out of 100 investigated and confirmed vitamin D deficient cases, 47 were males and 53 were females. 48 cases were from 25 to 49 years and 23 from 13-19 years. Most cases (92) were from urban areas. More than half (53) of the cases were referred for investigation after more than 3 visits to their physicians; 30 were investigated after two visits.

Joint pain was the chief complaint in 29 (61.7%) males; other complaints being recurrent fractures and muscle pain (19% each). In females, osteoporosis was the commonest disorder (45.2%) followed by anaemia (43%). 22.6% females with Vit-D deficiency were getting investigated for possible carcinomatosis. (Table 1)

Vitamin D levels in our study varied with various ailments. Lowest average levels were reported in history of recurrent fractures (4 ng/ml), followed by

suspicion of carcinoma (4.8 ng/ml), osteoporosis (5.1 ng/ml), anaemia (5.6 ng/ml) and muscle pain (6 ng/ml).

Table 1. Profile of Comorbidities

| Suspected diagnosis            | Male n=47 (%) | Female n=53(%) |
|--------------------------------|---------------|----------------|
| Anaemia                        | 8(17)         | 23(43)         |
| Impotence                      | 4(8.5)        | 0              |
| Suspicion of carcinoma         | 4(8.5)        | 12(22.6)       |
| Multiple sclerosis             | 2(4.2)        | 1(1.9)         |
| Autoimmune diseases            | 6(12.7)       | 8(15)          |
| Musculoskeletal pathologies    |               |                |
| Muscle pain                    | 9(19)         | 3(5.6)         |
| Joint pain                     | 29(61.7)      | 6(11.3)        |
| Osteopenia/Osteoporosis        | 2(4.2)        | 24(45.2)       |
| History of recurrent fractures | 9(19)         | 1(1.9)         |

## DISCUSSION

In the present study, joint pain as the major complaint among males followed by muscle pain and history of recurrent fractures. We have also observed that patients with history of recurrent fractures and osteoporosis are associated with significantly low levels of Vit-D. Most of the Vit-D deficient women were suffering from osteoporosis and anaemia. Although anaemia can be attributed to the menstruation during this age group, the high prevalence of osteoporosis during premenopausal period is a major concern. A sizeable proportion of women with Vit-D deficiency (mean level- 4.8 ng/ml) were also being investigated for possible carcinomatosis. Relationship between musculoskeletal disorder and Vit-D deficiency is well established. Several lines of evidence suggest that vitamin D deficiency may be a risk factor for cardiovascular, cancer and all-cause mortality. Ecological studies reveal that CVD events are higher in the winter when vitamin D levels are lower and cancer survival is better if the cancer is diagnosed in the summer when vitamin D levels are higher.<sup>8,9</sup> More than half of the cases reviewed were females. It is unclear why the association between 25(OH)D levels and morbidity is more pronounced amongst women. It may be that there is a hormone interaction between estrogens and 25(OH)D.<sup>10</sup>

The age group in which the people are more vulnerable to Vit-D deficiency is 25-49 years in this study has made two startling revelations. The

vulnerability of 3<sup>rd</sup> and 4<sup>th</sup> decade of life to. Older people are prone to develop Vit-D deficiency because of various risk factors: decreased dietary intake, diminished sunlight exposure, reduced skin thickness, impaired intestinal absorption, and impaired hydroxylation in the liver and kidneys.<sup>11,12</sup>

Therefore the findings in a comparatively younger population can be attributed to sedentary lifestyle, or a diet deficient in Vit-D along with inadequate exposure to sunlight. Similarly, more than half of the patients were screened for Vit-D levels only after three visits to their physicians is a concern not only to the patients but points towards a want of suspicion amongst the clinician in this part.

## CONCLUSION

This shows the need to have periodic screening of

vitamin D after the age of 25. There is obvious reluctance and lack of sensitization amongst the clinicians about the hidden hazards of Vit-D deficiency.

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