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The Deficiency and Insufficiency Status of Vitamin D in Chennai Population

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Abstract: ***Vitamin D is a fat-soluble vitamin required for the maintenance of normal blood levels of calcium and phosphate. This study is focused to know the vitamin D levels in Chennai population irrespective of age and sex. The study was carried out using 100 patient samples at Apollo Speciality Hospitals, Vanagaram, Chennai. The groups were divided into three as follows: Less than 30 years of age as Group I, 31 to 60 years as Group II and more than 60 years as Group III. The Vitamin D assay was done by Siemens Advia Centaur XP Immunoassay System. Out of 100 patients who visited Hospital, 17 were less than 30 years (Group I) with the mean Vitamin D value of 19.28 ± 14.14, 63 were in between 30 and 60 years (Group II) with the mean Vitamin D value of 20.65 ± 12.18 and 20 were more than 60 years (Group III) with the mean Vitamin D value of 24.74 ± 12.07. Among 50 males Vitamin Deficiency and Insufficiency were 29 (58 %) and 16 (32 %) respectively and among 50 females Vitamin Deficiency and Insufficiency were 28 (56 %) and 10 (20 %) respectively. The present study highlights the vitamin D deficiency and insufficiency irrespective of age and sex.***

Keywords: Ercocalciferol, Cholecalciferol, Calcitriol, Vitamin D Deficiency, Osteoporosis, Rickets

1. Introduction

Vitamin D is a fat soluble vitamin present as Ergocalciferol (vitamin D2) in plants and Cholecalciferol (vitamin D3) synthesized in skin by sunlight. Humans get vitamin D by either ingesting vitamin D or being exposed to sun light for enough time. It controls calcium absorption in small intestine and works with parathyroid hormone to mediate skeletal mineralization and maintain calcium homeostasis in the blood stream [1]. Without vitamin D, only 10 to 15% of dietary calcium and about 60% of phosphorus are absorbed [2,3,4]. Vitamin D deficiency is widespread in individuals irrespective of their age, gender, race and geography. Vitamin D deficiency is widely prevalent despite plentiful sunshine even in tropical countries like India [5, 6, 7]. Osteoporosis is the most common metabolic bone disease. A low vitamin D level is an established risk factor for osteoporosis. Inadequate serum vitamin D levels will decrease the active transcellular absorption of calcium. The present study highlights the vitamin D deficiency and insufficiency irrespective of age and sex in Chennai population by estimating the Vitamin D levels.

2. Literature Survey

Vitamin D deficiency in children causes growth retardation and classic signs and symptoms of rickets. In adults, vitamin D deficiency will precipitate and exacerbate both osteopenia and osteoporosis and increase the risk of fracture [8,9,10].

Muscle weakness has long been associated with vitamin D deficiency. A vitamin D receptor is present in skeletal muscle and vitamin D deficiency has been associated with proximal muscle weakness, increase in body sway and an increased risk of falling [11].

In adults it causes skeletal mineralization defect. The unmineralized osteoid provides little structural support for the periosteal covering. As a result, patients with osteomalacia often complain of isolated or global bone discomfort along with aches and pains in their joints and muscles [12].

The major source of vitamin D for humans is exposure to sunlight. Anything that diminishes the transmission of solar UVB radiation to the earth's surface or anything that interferes with the penetration of UVB radiation into the skin will affect the cutaneous synthesis of vitamin D_3 [13].

Aging is associated with decreased concentrations of 7-dehydrocholesterol, the precursor of Vitamin D_3 in the skin. A 70-y-old has 25% of the 7-dehydrocholesterol that a young adult does and thus has a 75% reduced capacity to make Vitamin D_3 in the skin. Because Vitamin D is fat soluble, it is readily taken up by fat cells. Obesity is associated with Vitamin D deficiency. Medications including antiseizure medications and glucocorticoids and fat malabsorption are also common causes of deficiency [14].

Malabsorption results in Vitamin D deficiency. For example, Cystic fibrosis patients have inefficient vitamin D absorption due to pancreatic exocrine insufficiency [15].

3. Materials and Methods

The blood samples of 100 Chennai patients who visited Apollo Speciality Hospitals, Vanagaram, Chennai from January 2022 to June 2022 were randomly taken for the study. The Vitamin D assay was done with serum samples using Siemens Advia Centaur XP Immunoassay System. The 100 patients were divided into three groups as follows: Less than 30 years of age as Group I, 31 to 60 years as Group II and

more than 60 years as Group III. The reference range for serum Vitamin D status is as follows, Deficiency: < 20 ng/mL; Insufficiency: 21-29 ng/mL; Sufficiency: >30 ng/mL; Toxicity: > 150 mg/dL. The basic statistical online tools and Microsoft XL were used for statistical calculations.

4. Results

Out of 100 patients who visited Hospital, 17 were less than 30 years (Group I) with the mean Vitamin D value of 19.28 ± 14.14, 63 were in between 30 and 60 years (Group II) with the mean Vitamin D value of 20.65 ± 12.18 and 20 were more than 60 years (Group III) with the mean Vitamin D value of 24.74 ± 12.07 (Table 1). Group I, II and III shows 11, 38 and 8 numbers of Vitamin D Deficiency which indicates 57 % totally. The insufficiency was 26 numbers (Table 2). Among 100 patients, 50 were male with the mean Vitamin D value of 20.29 ± 11.60 and 50 were female with the mean Vitamin D value of 22.18 ± 13.41 (Table 3). Among 50 males Vitamin Deficiency and Insufficiency were 29 (58 %) and 16 (32 %) respectively and among 50 females Vitamin Deficiency and Insufficiency were 28 (56 %) and 10 (20 %) respectively (Table 4).

Table 1: Vitamin D Levels among various Age Groups

Age Group (Years)	Number	Vitamin D Levels
Group I Less than 30	17	19.28 ± 14.14
Group II 30 - 60	63	20.65 ± 12.18
Group III More than 60	20	24.74 ± 12.07

Table 2: Various Levels of Vitamin D among different age groups

Vitamin D Levels	Group I	Group II	Group III
Deficiency (<20)	11	38	8
Insufficiency (21-29)	4	15	7
Sufficiency (≥30)	2	10	5

Table 3: Vitamin D Levels among Male and Female

S. No	Sex	Number	Vitamin D Levels
1	Male	50	20.29 ± 11.60
2	Female	50	22.18 ± 13.41

Table 4: Various Levels of Vitamin D among Male and Female

Vitamin D Levels	Male	Female
Deficiency (<20)	29	28
Insufficiency (21-29)	16	10
Sufficiency (≥30)	5	12

5. Discussion

The prevalence of Vitamin D deficiency is reported worldwide, both in sunshine deficient and sunshine sufficient countries. Still it is the most underdiagnosed and undertreated nutritional deficiency in the world [16,17]. However, various studies showed poor Vitamin D status irrespective of age, sex and geography.

The present study shows Vitamin D level of female as 22.18 ± 13.41 irrespective of age and more specifically among 50 females Vitamin Deficiency and Insufficiency were 28 and 10 respectively; male as 20.29 ± 11.60 irrespective of age and more specifically among 50 males Vitamin Deficiency and Insufficiency were 29 and 16 respectively. It was supported by an earlier study in which the wide spread Vitamin D Deficiency has been recognized in Indians of all age groups and both sexes [18,19]. Another study by Harinarayan et al., reported vitamin D level of 14.6±7 and 20.85±8.63 ng/ml in postmenopausal women in the age group of 50-67 years [20]. A study from North India, confirms the high prevalence of Vitamin D Deficiency in both men and women in older age groups [21].

The present study shows the Vitamin D deficiency of 57 % and insufficiency of 26 % irrespective of age and sex. This Vitamin Deficiency as per our study is supported by various Indian studies as follows: The community-based Indian studies of the past decade done on apparently healthy controls reported a prevalence ranging from 50% to 94%, except for one study which reported a prevalence of 34.5% which can be due to the low cutoff. These studies which included various age groups reflect the magnitude of the problem. High prevalence was seen throughout the country [22,23,24]. Hospital-based studies showed a prevalence of Vitamin D Deficiency ranging from 37% to 99% [25,26, 27]. A school-based study on premenarchal girls (n = 214) in Pune was conducted by Kadam et al. in 2011. It showed a prevalence of 34.2% of Vitamin D [28]. Another school-based study done by Kapil et al. in 2017 on 1222 school children aged 6 - 18 years in Kangra and Kullu districts of Himachal Pradesh, showed the prevalence of 81% and 80% respectively [23].

6. Conclusion

The present study highlights the vitamin D deficiency and insufficiency irrespective of age and sex. Although there is an awareness of the causes of Vitamin D deficiency, we are not able to prevent it to a large extent. India being a tropical country has adequate sunshine. Most of our population live in areas with adequate sunlight throughout the year and are expected to have adequate Vitamin D. The prevalence of Vitamin D deficiency is high may be due to poor exposure to sunlight, dietary habits and lower intake of Vitamin D fortified foods.

7. Future Scope

The prevalence of Vitamin D Deficiency is high may be due to poor exposure to sunlight, dietary habits and lower intake of Vitamin D fortified foods. This deficiency has many consequences which are still being explored, apart from the well-known skeletal complications. The establishment of new

reference range or supplements for prevention of Vitamin D Deficiency can be achieved by multiple researches in future.

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