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Status of Serum calcium, phosphorus and Vitamin D

Medical Science

KEYWORDS : 25(OH) Vitamin D, calcium, phosphorus, serum

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ABSTRACT

Vitamin D (Vit D) is a necessary constituent for the regulation of serum calcium and phosphorus. The current study assessed the status of serum calcium and phosphorus with Vitamin D. Serum calcium, phosphorus and 25(OH) Vitamin D were measured in 50 subjects between 16-50 years of age admitted or visited in the L.U.H City and Jamshoro Hospital. The results obtained showed that the serum concentrations of Vitamin D in patients were significantly lower than the healthy controls. However, the concentrations of serum calcium and phosphorus had no significant differences as compared to the controls. Mean serum 25(OH) Vitamin D was 14.15±4.33µg/mL. Mean serum calcium was 9.64±3.21 mg/dL. Mean serum phosphorus was 2.53±0.12 mg/dL. It is suggested that due to its multi system implications patients presenting with different signs & symptoms and especially when to establish a diagnosis is difficult. Health education should be imparted to population and awareness should be created to increase the exposure to sunlight to allowed limits.

INTRODUCTION

Vitamin D (Vit D) is a fundamental component for the forming and support of bone structure. Vitamin D deficiency leads to osteomalacia and rickets and mild deficiency induces secondary hyperparathyroidism and elevated resorption of bone (1). Vitamin D retains the average serum calcium level by increases the absorption of calcium in intestine (2, 3). Decreased serum phosphorus levels due to increased renal excretion of phosphate caused by secondary hyperparathyroidism caused by Vitamin D deficiency (4). There are a few studies available to prove that Vitamin D deficiency is uncommon in Pakistan. In adults prolonged deficiency of vitamin D (Calciterol) can lead to osteomalacia (5, 6) while lesser deficiency insufficiency is correlate with several non-specific signs. (5).

There is increasing evidence that vitamin D insufficiency, by leading to sustained hyperparathyroidism, is deleterious to the skeleton, mostly cortical bone; it is without symptoms till fractures occur. (7) Because of high prevalence of vitamin D deficiency in Asia its multi system implications, and as serum calcium and phosphorus levels do not predict exactly its deficiency (8), with a few studies available in this regard in Pakistan resulted in initiation of this study. The current study was designed to assess the status of calcium and phosphorus with Vitamin D deficiency.

Methodology

Blood samples were collected from 50 healthy controls in fasting condition and similar conditions were maintained while taking the blood samples of patients. Patients (both gender) included males and females aged between 16 and 50 years old and 50 healthy controls were admitted or visited at the L.U.H city and Jamshoro Hospital.

Serum Vitamin D concentrations were determined by using high performance liquid chromatography model Agilent 1100 Series by using Variable Wavelength Detector (VWD) using vitamin D kit (Roache Company 100 test pack) Detection was made on Variable Wavelength Detector at wavelength=280nm. Separation of Vitamin D was performed on a Column used in HPLC was C-18 pre-packed obtained with serial #c538995, 1.51456. RP-18e (5µm) obtained from Merck.

Stock standard solutions of 25-OH were prepared at 10 µg/mL in methanol. Calibration standard solutions were prepared from these stock solutions at 5, 10, 25, 50 and 100 µg/mL; internal standard was diluted to 400 µg/mL with deionized water. Samples were centrifuged at 1500 rpm for 20 minutes; for the determination of the calcium and phosphorus levels were analyzed using flame photometer (M-410 CORNING).

Statistical analysis

Statistical evaluation of all data was done on SPSS software for windows (Statistical Package for Social Sciences version 16) for data management and analysis and the MS excel for charts. Quantitative data were presented as mean ± SD.

In addition to the clinical examination, questionnaire was filled for each participant which included variables like height (cm), weight (kg), BMI (kg/m2) and age (years), sun exposure (hours/day), and dietary habits.

Result

The status of Vitamin D and calcium and phosphorus levels were analyzed in 50 participants. Table 1 shows the levels of Vitamin D with Phosphorus and calcium of the subjects. The average serum Vitamin D was 14.15nmol/l whereas, no difference in serum calcium mg/dl and phosphorus mg/dl levels as compared to the controls.

TABLE – 1

Variables	Patients	Controls
Calcium	9.64±3.21	9.65±2.15
Vitamin D	14.15±4.33	40.46±5.42
Phosphorus	2.53±0.12	2.52±0.15

Figure 1: Shows the decreased level of Vitamin D patients as compared to the controls.

Fig: 2 and 3 shows the serum phosphorus and calcium level had no significant difference in patients as compared to controls

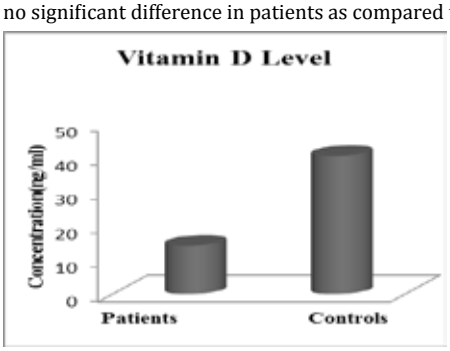

Fig: 1

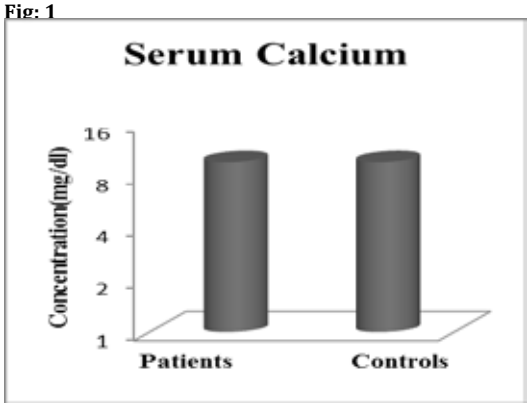

Fig: 2

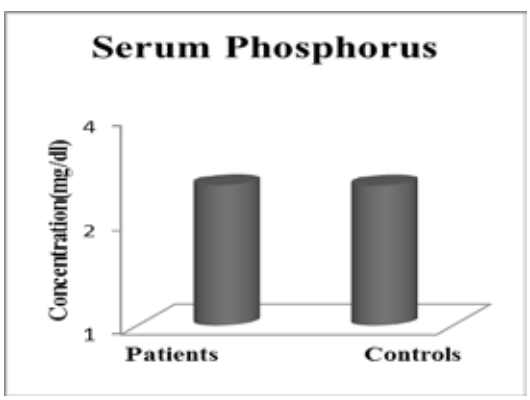

Fig: 3

DISCUSSION

Vitamin D deficiency is a common disease in the world; it has been widely reported in all age groups in recent years. Hypovitaminosis and Vitamin D deficiency has been in developed and developing countries (9). Vitamin D is important for calcium absorption and bone growth (9). Low Vitamin D level has association with insulin resistance and Betacell dysfunction. Highest Vitamin D levels associated with 60% improvement in insulin sensitivity. (10) Study with 50 patients with determined, nonspecific musculoskeletal pain at Mayo clinic revealed that 60% had vitamin D deficiency. (11) As data of adult population, as far as deficiency of vitamin D is concerned, is lacking so this study was conducted to define the prevalence of vitamin D deficiency in outpatient clinic, its correlation to presenting symptom of bones or body aches and to the serum level of calcium and phosphorus. The study showed significantly high prevalence of vitamin D deficiency in the population of Hyderabad Sindh. Deficiency recorded in our study in sample population was 95% having insufficient levels. Possible factors may be due to decreased intake or lack of sun exposure due to social reasons. (11) Vitamin D deficiency can occur without any signs and symptoms. If symptoms are present, it specifies severe deficiency. Similar observations were made in this study, 60% patients were having bones or body aches on presentation while remaining 40% were having no complains showing insignificant relation between deficiency and symptoms. Hence, the concept that musculoskeletal pain is directly associated with vitamin D deficiency (12) is not matched to the results of this study. This study also founds the fact mentioned in international literature that vitamin deficiency has no relation to the serum calcium and phosphorus levels. In our study all the vitamin D deficient population was having normal serum calcium and phosphorus. In our study, the serum level of 25(OH) D that is necessary for the provision of normal physiologic requirements for bone structure. To date, various relationships of calcium and phosphorus with serum Vitamin D levels have been reported. Some studies have reported a significant correlation between 25 (OH) D and calcium and between 25 (OH) D and Phosphorus Levels (13, 14), while other studies have not shown any association between these calcium and phosphorus and serum 25 (OH) D level (13, 15, 16). Our study showed significantly lower levels of Vitamin D and there was no significant difference between serum calcium and phosphorus levels. However, based on the results of the present study, further more extensive assessment is necessary to reveal any relation between these biochemical parameters specifically hypocalcemia and osteomalacia.

CONCLUSION

Vitamin D deficiency is much more prevalent in our country as compared to Western countries, particularly young population is more suffering to this new endemic, more ever often it is asymptomatic and also serum calcium, phosphorus levels are not predictable indicator of its underlying deficiency. It is suggested that due to its multi system implications patients presenting with different signs and symptoms and where to establish a diagnosis is difficult, serum vitamin D3 levels may be requested. Moreover, to overcome this issue it is recommended that health education be imparted to population and awareness should be created to increase the exposure to sunlight to allowed limits.

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