

# Vitamin -D Deficiency: A Clinical Problem Searching For Solution.

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## Abstract

The role that Vitamin D plays in human health is no more hidden in this modern age where every individual carries the knowledge treasure in the pocket (The internet) but the unjustified deficiency or insufficiency is still a research question waiting for the answer from research community all over the world. Normal levels (30-50 ng/ml) are necessary for the development of teeth and bones in children and bone mineralization in adults. The deficiency or insufficiency causes rickets, arthralgia, arthritis, osteoporosis and Osteomalacia.

**Study design:** Observational study.

**Study Setting:** Department of Orthopedic LUMHS Jamshoro.

**Study Duration:** from April 2017 to Oct 2017.

**Sampling:** 600 patients were selected through Consecutive sampling.

**Statistical Analysis:** Descriptive statistics like mean, Standard deviation, minimum, and maximum were calculated Using SPSS version 22. Mean of two genders was compared using t-test setting  $\leq 0.05$  as level of significance.

**Results:** Mean serum vitamin -D level was  $16.11 \pm 10.07$  ng/ml in men while it was  $16.63 \pm 11.73$  ng/ml in women. 62% of the study population was found deficient ( $< 20$  ng/ml) while 16.33% were having insufficient levels ( $< 30$  ng/ml) and only 12% showed normal levels (30-50 ng/ml). There was no significant difference between the two genders, p value 0.59

**Conclusion:** Vitamin -D deficiency is very common in both genders with no significant difference between males and females.

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## Introduction

Vitamin-D, a fat soluble vitamin is a derivative of cholesterol. Endogenously sun light exposed skin converts 7-Dehydrocholesterol to cholecalciferol that subsequently gets changed into 25-hydroxycalciferol in the liver and 1,25 dihydroxycalciferol in the kidneys. Other sources include eggs, fish, liver and milk with daily requirement of 15ug/day till 70 years of age for the regulation of calcium through absorption and excretion. Apart from treatment of Rickets, Osteomalacia, hypoparathyroidism and renal osteodystrophy vitamin D is thought to modulate the immune status of individual through cathelicidin<sup>1,6</sup>. Reference ranges of this important vitamin are described as deficiency when serum level is <20ng/ml, insufficiency at <30 ng/ml, sufficiency at <50 ng/ml and toxicity at >150ng/ml<sup>3</sup>. The prevalence of deficiency of vitamin-D<sub>3</sub> is from 30%-90%<sup>2,3</sup>. Vitamin D deficiency is reported to be a risk factor for the infectious diseases in children by many researchers<sup>4,5</sup>. This vitamin is suggested to be affecting the immune system through, a peptide having antimicrobial activity and through amplifying the activity of macrophages and B-cells<sup>6</sup>. Vitamin -D<sub>3</sub> deficiency is caused by either a reduced intake or reduced synthesis<sup>7</sup>. The history of vitamin D deficiency is very old as it was described by Dr. Daniel in 1645 and Trousseau in 1861 from England and France respectively declaring rickets to be associated with reduced diet and exposure to sunlight<sup>8</sup>. There may be sex differences in prevalence of vitamin D<sub>3</sub> deficiency as pointed out by a Korean study<sup>9</sup>. Initially the deficiency is symptomless, but if it persists longer, the symptoms appear which may vary from patient to patient<sup>10</sup>. There were few studies on this topic with certain gaps of knowledge, so the current study was planned to estimate the vitamin-D<sub>3</sub> status of the general patient population in Hyderabad city and to compare to compare the same in the two genders male and female.

## Methodology

We selected the patients of both genders and blood was drawn under aseptic measures after informed written consent from the participants. Vitamin -D<sub>3</sub> was checked in Research lab of the Liaquat University of Medical and Health Sciences Hyderabad. Machine used was Architec Abbot I 2000 for serum levels. Patients of

joint pain were selected for this study involving all age groups. Patients already on vitamin D<sub>3</sub> therapy or serum vitamin D<sub>3</sub> levels >50 were excluded. Other diseases associated with this deficiency were also excluded. International protocols were adopted in dealing with patients and blood samples.

## Statistical Analysis

Obtained data figures were processed through SPSS version 22 to determine mean, standard deviation, minimum, maximum values collectively as well as individually in male and female groups.

## Results

Total 600 subjects were taken as consecutive samples, 58(9.63%) subjects were separated as the levels were above 50ng/ml with maximum of 166ng/ml, remaining 542 patients were having their vitamin D levels ≤50. There were 213 male and 329 females. Mean vitamin-D levels in the study population was found 16.25±11.9 with 2.8 the minimum and 50.40 the maximum in study population while. The mean in male and female was found 16.11±10.07 and 16.63±11.73 respectively. 62% of the study population was found having deficiency (<20ng/ml) while 16.33% were having insufficient levels (<30ng/ml) and only 12% showed normal levels (30-50ng/ml). There was no significant difference found between male and female genders (p value 0.59). (Table 1) (Table 2) (Figure 1)

## Discussion

Most of the study subjects (62%) were found to be deficient so need correction with the parenteral injectable form of vitamin D, that was consistent to 61% reported by Edmondo F et al 2012 but his study was based on chronic liver diseases patients<sup>11</sup>. Rahmoon AG et al 2015 also reported 57.14% of the vitamin D severe deficiency in alcoholics<sup>12</sup>. Ghazal A et al 2015 mentioned 83.9% of the children to be deficient in his study<sup>13</sup>. Only few (16.33%) from the 600 patients were found insufficient so got advised to improve the diet rich in vitamin-D and sun exposure along with oral supplementations. Some (9.66%) of the population was having the vitamin-D levels >50ng/ml so were not included in the study while comparing the mean of two groups as they were outliers. This shows a poor knowledge of dosage of this vitamin in the physicians or self-medication by the patients that needs itself motivations. The goal of the

Table 1. Showing Mean difference of vitamin D levels between two genders

Groups	Vit-D Levels ng/ml	t-score	P-Value
Male (213)	16.11±10.07	-0.53	0.59
Female (329)	16.63±11.73		

Table 2. Over all calculations of the vitamin –D levels in the study participants.

Parameters	Values
Mean and S.D	16.42±11.10
Minimum	2.80
Maximum	50.40
Deficiency (0-20 ng/ml)	372 (62%)
Insufficiency (20-30 ng/ml)	98 (16.33%)
Normal (30-50 ng/ml)	72 (12%)
High (>50-150 ng/ml)	50 (8.33%)
Toxic (>160ng/ml)	08 (1.33%)

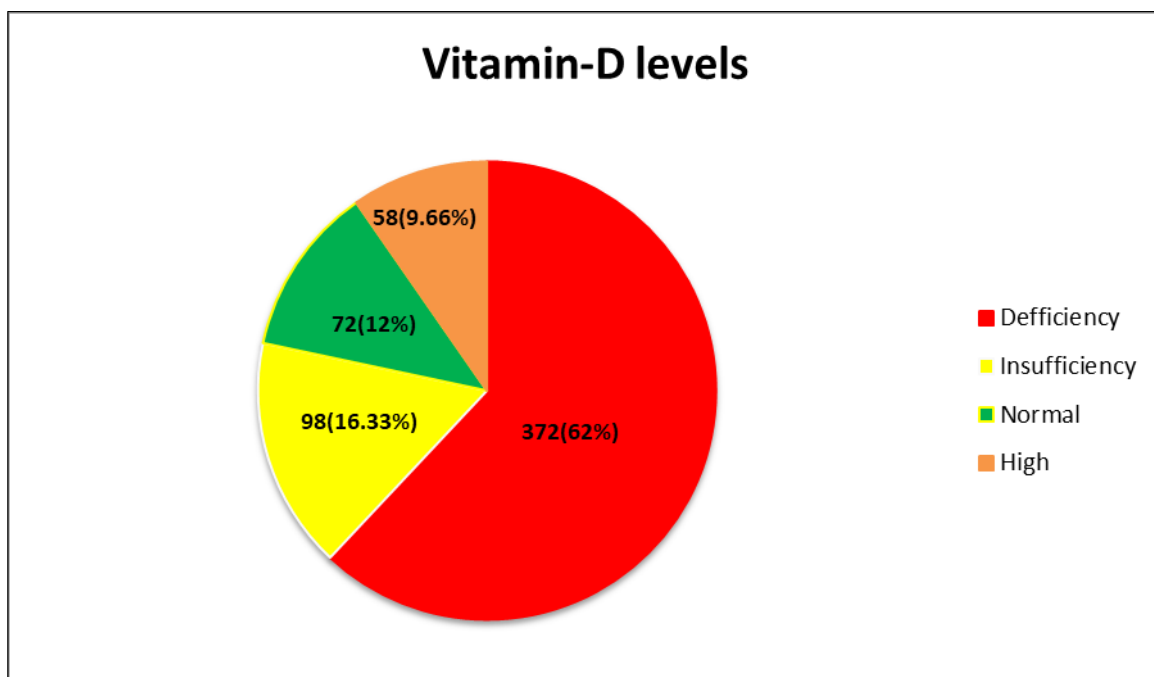


Figure 1. Pie chart of mean serum vitamin D3 levels in male and female subjects

treatment in vitamin D deficiency is to raise the plasma levels at >30ng/ml that normalizes the calcium, reverses hyperparathyroidism as well as osteitis fibrosa partially. The deficiency or insufficiency of Vitamin D should be treated with higher doses of 4000 units/day or 50000 units/wk for several weeks<sup>14</sup>. Our current study was quite surprising to observe a greatly reduced serum vitamin D levels in the study population but similar findings were reported from Kingdom of Saudi Arabia by Farhan J D et al (2018) where this deficiency was 44%, 64% and 41% from year 2010, 2013 and 2017 respectively<sup>15</sup>. Consistent to us is another hospital based study of USA by Scott MG et al (2015) showing about 50% of the population which was tested was found to be deficient for this vitamin<sup>16</sup>. Boyages SC (2016) mentioned 50% deficiency in Australia that is also nearly what we found suggesting strategies to reduce this economic burden<sup>17</sup>. Our current work was consistent to what we published earlier in 2017 with similar findings for mean levels in the two genders<sup>18</sup>. It seems that the Hyderabad city is overcrowded and there is reduced sun exposure to the public with most of the population living in the flats and closed apartments or the modified life style is responsible for this reduction in serum levels of such an important vitamin. The universal deficiency affecting most of the countries in the world suggests the main reason for such universal deficiency needs to be discovered? Till that goal is achieved, the easiest approach is prescribing Vitamin D supplementation to the population suffering from Vitamin-D deficiency; in addition, there should be proper designs for future architecture to have a courtyard in the east side of the flats & a central open roof system to secure future generations from diseases associated with Vitamin-D deficiency. On the other hand, a minor percentage ( $\approx 10\%$ ) of the sample size, vitamin-D level is higher than 50ng/ml which is above the common normal range (30-50 ng/ml); this might have occurred due to improper dosage, duration, or self-prescription of Vitamin D supplementations; this makes us recommend both physicians & patients education.

## Conclusion

The population of Hyderabad city is highly deficient in vitamin D and both genders are almost equally affected.

## Recommendations

- Public awareness workshops should be conducted in schools and community.
- Doctors should focus on monitoring the status of vitamin D to avoid hypo and hyper conditions.
- Large scale studies are recommended in children as well as adults.

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