

VITAMIN D LEVELS IN KASHMIRI POPULATION, A PROSPECTIVE STUDY.

B.A.Mir, M.Iqbal Wani

Bashir Ahmad Mir, MBBS, MS (Ortho); **Mohd Iqbal Wani** MBBS, MS (Ortho); Associate Professors ,Department of Orthopedics, Government Hospital for Bone And Joint Surgery Barzulla; Govt Medical College Srinagar.

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Correspondence: Dr.BA Mir ,Associate Professor ,Department of Orthopedics, Government Hospital for Bone and Joint Surgery Barzulla ,Govt.Medical College ,Srinagar
Email : bmladakhi@gmail.com

Abstract

Aim of Study: Vitamin D is a nutrient, a vitamin as well as a hormone. It helps in the absorption of calcium from intestines and kidneys; and in bone mineralisation. Vitamin D deficiency in the long term leads to bones with less mineral content, that are weak and brittle. Vitamin D deficiency leads to Rickets, osteomalacia and osteoporosis. Vitamin D deficiency is the most common nutritional deficiency in the world with 70%–100% prevalence in India. Our aim was to study the extent of this deficiency in Kashmir.

Methodology: Most reliable marker of vitamin D status is serum concentration of 25 hydroxycholecalciferol. Our study included 140 healthy people (70 men and 70 women) who were accompanying patients to our hospital. Venous blood was analysed for Vitamin D levels.

Conclusions: Our study found that vitamin D is deficient in Kashmiri population (81% of test population). Vitamin D deficiency was more common than insufficiency. Vitamin D inadequacy was more in women population. In women the deficiency was more severe not only in the elderly but also in younger age group, women 30-50 years of age had relatively less inadequate vitamin D levels.

Key Words: 25-hydroxycholecalciferol, vitamin D deficiency

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Introduction

Vitamin D deficiency is the most common nutritional deficiency in the world, spanning across all ages, sexes, religions, regions and races. In India vitamin D insufficiency and deficiency is as high as 70%–100%.^{1,2} This deficiency is prevalent in all parts of India, in all age groups. Vitamin D deficiency was highly prevalent in pregnant women and lactating mothers.

Vitamin D is synthesized in the skin from cholesterol on exposure to UVB rays. Sun exposure alone should suffice for vitamin D needs. However, vitamin D is still deficient throughout the world and in India as well.³

Vitamin D deficiency not only impairs the bone health but also has adverse effects on extra-skeletal systems contributing to the already enormous burden on the healthcare system of India.

The most reliable marker of vitamin D status is the serum concentration of 25 hydroxycholecalciferol. In our study we will define vitamin D deficiency as levels below 20 ng/mL. At this level serum calcium level begins to fall and PTH begins to increase. Insufficiency as 20–30 ng/mL and sufficiency as ≥ 30 ng/mL, Intestinal Calcium absorption peaks maximum at 30 ng/ml.³

Since vitamin D undernutrition is largely silent and subclinical, the indication for testing remains controversial.

Vitamin D Metabolism

Vitamin D₃ can be synthesized in sufficient amounts on adequate exposure of the skin to sunlight (UV-B rays). Vitamin D₃ is also found in animal food sources e.g., fatty fish, cod liver oil, milk, etc.⁴

Most plants are not sufficiently rich in vitamin D content except for vitamin D₂

(ergocalciferol) which is found in yeast and mushrooms.⁵

Vitamin D is a prohormone which requires two hydroxylations to finally attain its biologically active form— 1,25 dihydroxy Cholecalciferol. The first hydroxylation occurs in the liver, at position C-25 to 25(OH)D. 25(OH)D is the major circulating form of vitamin D. The second hydroxylation occurs in kidneys at position C-1 α to form 1,25(di-OH)D, also known as calcitriol. Calcitriol is released in blood, where it binds to vitamin D binding protein (DBP) and reaches its target tissues to exert its endocrine functions through the vitamin D receptor (VDR).⁶

Skeletal health

The most well recognized function of calcitriol involves regulation of calcium and phosphorus balance. Vitamin D helps in the absorption of calcium from intestine, and resorption of calcium in kidneys and in bone mineralisation. Vitamin D deficiency in the long term this leads to bones with less mineral content, leading to weak and brittle bones. Vitamin D deficiency leads to Rickets, osteomalacia and osteoporosis. Rickets results from inadequate mineralization of growing bone. Thus it is a childhood disease and it is manifested as

| Age group | people | Vit D Status | | | Insufficient/deficient (%age) |
|--------------|-----------|--------------|-----------|-----------|---|
| | | Sufficient | Insuffi. | Deficient | |
| 20-39 | 17 | 4 | 8 | 5 | 13 (76.5%) |
| 30-39 | 15 | 5 | 6 | 4 | 10 (66.6%) |
| 40-49 | 13 | 3 | 3 | 7 | 10 (77%) |
| 20-49 | 45 | 12 | 17 | 16 | 33 (73%) 38% insufficient-35.5% deficient |
| 50-59 | 14 | 2 | 5 | 7 | 12 (86%) |
| 60-69 | 9 | 2 | 3 | 4 | 7 (78%) |
| 70-79 | 2 | 0 | 0 | 2 | 2 (100%) |
| 50-79 | 25 | 4 | 8 | 13 | 21 (84%) 32% insufficient-52% deficient |
| Total | 70 | 16 | 25 | 29 | 54 (77%) 36% insufficient- 41% deficient |

bone deformities, bone pain and weakness. Chronic vitamin D deficiency in adults results in osteomalacia, osteoporosis.^{7,8}

Extraskelatal Effects

Various studies have associated vitamin D deficiency with many chronic diseases like, decreased immunity, autoimmune diseases, cardiovascular diseases, diabetes, cancer etc.⁹

Materials and Methods:

We included 140 healthy people (70 men and 70 women) who were accompanying patients to our hospital and who volunteered in this study. After we obtained informed consent, subjects were evaluated for any significant medical or surgical history. Subjects taking vitamin and mineral supplementation or any drugs or sunscreens were excluded from the study. Venous blood samples were collected under basal conditions. The samples were sent to a nearby laboratory in tubes without anti-coagulants for analysis.

Result:

Our study included 70 men and 70 women from 20 to 80 years of age as shown in the table

Our study found that vitamin D is generally deficient in Kashmiri population.

Overall 113 subjects (81% of test population) had decreased levels of vitamin D, and out of them more than half were deficient rather than insufficient. Vitamin D inadequacy was more in women population, 84% as compared to male population, 77%. In both groups vitamin D deficiency was more common than vitamin D insufficiency.

In men the deficiency was less in younger age group (< 50 years), than in older age group (>50). In women however deficiency was more severe not only in the elderly group (>50 years) but also in younger age group (<30 years), women 30-50 years of age had relatively less inadequate vitamin D levels.

In both men and women younger than 50, vitamin D insufficiency was more common than deficiency while in those older than 50, vitamin D deficiency was more common.

Discussion:

Our study found alarmingly high prevalence of vitamin D deficiency in Kashmiri population. Similar results have also been found in previous studies¹⁰. Despite abundant sunlight, a high

prevalence of vitamin D deficiency has been reported other regions in India and other South Asian countries as well.^{11, 12, 13, 14}

Other studies have demonstrated that Vitamin D is particularly deficient in osteoporotic people. Globally, almost 25% of osteoporotic women were observed to have vitamin D levels less than 10 ng/ml¹⁵

Our study found an alarmingly high prevalence of vitamin D inadequacy in apparently healthy, adults. Vitamin D insufficiency is particularly high in older age and women, and among women it is more severe and common not only in the older age but also in the younger age as well. It is likely to be even higher and more severe in children, and in pregnant women.

Cultural and social practices contribute somewhat to this deficiency as in Kashmir people are heavily clad, and majority of the people stay indoors, there is no social space for sports and other outdoor activities, especially for women. Over the past few decades desk-work, studies and indoor occupations have begun consume major portion of people's time.

Vitamin D content in Kashmiri staple foods (plant food and red meat) is low. A large portion of Kashmiri population is poor. They generally suffer from overall poor nutrition and suffer many deficiencies including vitamin D deficiency. Also the awareness of general population regarding vitamin D is poor. On top of that female population is especially neglected, and because of that, the infants and children also get low levels of vitamin D from before birth and in early life.

With such high prevalence of vitamin D inadequacy, screening seems to be useless and will waste the already deficient health budget.

Vitamin D supplementation seems to be a

nice idea. In India, physicians often prescribe D3 60,000 IU per week for 8 weeks for vitamin D deficiency. In a study, twenty two healthy Indians with subnormal serum 25(OH)D levels were supplemented with oral D3 60,000 IU/week and calcium 1 gm/day for 8 weeks. At 8 weeks the mean 25(OH)D levels increased from 10.16 (3.96) ng/mL to 22.4 (6.8) ng/mL and serum PTH normalized in all. Twenty two of the 23 subjects had 25(OH)D levels > 20 ng/mL. At the end of 12 months however, all the subjects were vitamin D deficient, once again. To sustain optimal 25(OH)D levels vitamin D supplementation would need to be ongoing after the initial loading¹⁶. More frequent and lower doses (not exceeding 4000 IU/day) of vitamin D may be better for maintenance of serum vitamin D level. Vitamin D status should be 30 ng/mL or above to derive both skeletal and extraskelatal benefits vitamin D, but with a precautionary stance to not exceed 100 ng/mL.¹⁷

However such long term Vitamin D supplementation will not be cost effective and socially acceptable in Kashmir.

In such conditions, fortification of common food items seems to be the best option. But in a country already deficient in every necessary amenity and where government and public are generally unconcerned with

| Age group | people | Vit D Status | | | Insufficient/deficient (%age) |
|--------------|-----------|--------------|-----------|-----------|---|
| | | Sufficient | Insuffi. | Deficient | |
| 20-39 | 13 | 2 | 5 | 6 | 11 (85%) |
| 30-39 | 9 | 2 | 4 | 3 | 7 (78%) |
| 40-49 | 25 | 5 | 9 | 11 | 20 (80%) |
| 20-49 | 47 | 9 | 18 | 20 | 38 (81%) 38% insufficient- 43% deficient |
| 50-59 | 14 | 2 | 5 | 7 | 12 (86%) |
| 60-69 | 5 | 0 | 3 | 2 | 5 (100%) |
| 70-79 | 4 | 0 | 1 | 3 | 4 (100%) |
| 50-79 | 23 | 2 | 9 | 12 | 21 (91%) 39% insufficient- 52% deficient |
| Total | 70 | 11 | 27 | 32 | 59 (84%) 38% insufficient- 46% deficient |

| Age group | people | Vit D Status | | | Insufficient/deficient (%age) |
|--------------|------------|--------------|-----------|-----------|--|
| | | Sufficient | Insuffi. | Deficient | |
| 20-49 | 92 | 21 | 35 | 36 | 71 (77%) 38% insufficient- 39% deficient |
| 50-79 | 48 | 6 | 17 | 25 | 42 (87%) 35% insufficient- 52% deficient |
| Total | 140 | 27 | 52 | 61 | 113 (81%) 37% insufficient- 44% deficient |

public health, such mass fortification of food is also a utopian idea.

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