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Sun Exposure is Best Source of Vitamin D than Good Diet & Supplement in South India

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ABSTRACT: Vitamin D (VitD) plays pivotal role in calcium homeostasis & bone mineral metabolism; has wide ranges of biological functions like cell proliferation & differentiation, immune system. Deficiency increases risk of osteoporosis, diabetes, hypertension, cardiovascular disease, cancer, etc. Low Vit D can be attributed to lifestyle changes. Indian diet generally fails to satisfy the daily requirement of Vitamin D for a normal adult. **Methods and Material:** Apparently healthy persons were divided in 02 study groups. **Gr-A:** 160 subjects were divided into 04 sub-groups – Control: Construction labourers, 25-60 yrs, (n=30, M:F=19:11) exposed to good sunlight, Gr-I: 20-35yrs (n=20, M:F=10:10), Gr-II: 36-50 yrs (n=44, M:F= 17:27) &Gr-III>50yrs (n=66, M:F=26:40) belongs to middle-upper class came for routine health check-ups; total M:F=72:88. **Gr-B:** n=40, Vit D deficient individuals orally supplemented with Vit D for 8 weeks (60,000 IU/week). normal. Gr-I: 25-30 yrs (M:F=10:10) &Gr-II: 55-65yrs (M:F=10:10). VitD was assayed by Competitive Electro chemiluminescence immunoassay in Roche e411. **Results:** **Gr-A** (ng/ml): Overall, Control: 29.97±7.14 Gr-I:14.60±4.51, Gr-II: 15.87±5.90 &Gr-III: 15.71±6.023 (all the different age groups Vs. control, p<0.0001; no significant difference). **Gr-B** Before Vs. after oral Vit D supplement - Gr-I: 8.96±0.96 & 31.59±2.90; Gr-II: 5.12±1.27 & 31.78±1.34 (before Vs. after, p<0.0001). After 08 weeks Vit D supplement discontinuation, Gr-I=7.05±1.00 & Gr-II=9.0±3.00 (before supplement=discontinuation) **Conclusions:** Study infers good sunlight exposure is best to maintain Vit D levels than taking supplements and dietary source, no significant difference in levels in male and female. After 08 weeks discontinuation, the levels return back to pre-supplement levels

KEYWORDS: Vitamin D, Deficiency, life style

I. INTRODUCTION

Vitamin D is a fat-soluble vitamin, known for its antirachitic activity.¹ Calciferols are a group of lipid-soluble compounds with a 4-ringed cholesterol backbone and refer to both, Vitamin D3, i.e., cholecalciferol and Vitamin D2, i.e., ergocalciferol². Vitamin D, in general, refers to Vitamin D3. Vitamin D can be synthesized endogenously. About 90% of the required Vitamin D is synthesized in the skin under sun exposure³.

It is needed for the maintenance of normal blood levels of calcium and phosphate that are required for normal mineralization of bone, muscle contraction, nerve conduction, and general cellular function in all cells of the body. It is also found to be important for immune function, for inflammation, cell proliferation, and differentiation^{3,4}.

The active form of Vitamin D stimulates the absorption of calcium in the duodenum and increases calcium influx in distal tubules of kidney through nuclear Vitamin D receptor (VDR); latter is specifically regulated by parathormone level⁵.

The major source of Vitamin D is the endogenous synthesis in skin on exposure to sunlight, namely, ultraviolet B (UV-B) radiation of wavelength 290–320 nm. Main dietary sources are fish, fortified food, and supplements. Vegetables and grains are poor sources.

Synthesis of vitamin in skin on exposure to UV-B is also affected by latitude, solar zenith angle, atmospheric pollution, ozone layer, and melanin pigmentation⁶.

In the skin, ultraviolet light catalyzes conversion of 7-dehydrocholesterol to Vitamin D3, which is released into the bloodstream, in bound form (along with Vitamin D-binding protein^{3,4,7}).



From the blood, it reaches liver to form 25-hydroxyvitamin D (25(OH)D). This is followed by formation of 1, 25-dihydroxyvitamin D, the most active form of Vitamin D in the kidney by hydroxylation and in some other tissues in which the mechanism is unclear.

Formation of 1, 25 dihydroxyvitamin D, is the key step in regulating Vitamin D metabolism, which is increased by low serum phosphate concentrations and low serum calcium, mediated by parathyroid hormone. Cellular receptors for active form of Vitamin D are found in intestine, bone, and in many other tissues also.

25(OH)D is the most useful measure and reflects the Vitamin D status in the body because the level depends on the available and circulating Vitamin D⁸. The level of 1, 25 dihydroxyvitamin D is also a direct measure for assessing Vitamin D status; however, it is not used because of its regulation by calcium, phosphate, and parathyroid hormone concentrations. The half-life of 1, 25 dihydroxyvitamin D, calciferol, and 25(OH)D are 4 h, 24 h, and 3 weeks, respectively.

Clinical manifestation of rickets occurs only when there is severe Vitamin D deficiency. The sunlight exposure can be the most important determinant of 25(OH)D concentrations. Seasonal variation should be considered as there is difference in summer and winter season.

II. SUBJECTS AND METHODS

Study is conducted in a private hospital in outpatient department and staff working in hospitals and construction labours in the area.

In the study (1) healthy construction labourers, age 25-60 yrs, (n=30, M:F=19:11) compared with office working individuals, for health check-up visiting tertiary care Hospital, Vishakhapatnam, Andhra Pradesh, INDIA (n:130 M:F=72:88) individuals were divided into 03 sub-groups – Gr-I: 20-35yrs (n=20, M:F=10:10), Gr-II: 36-50 yrs (n=44, M:F= 17:27) &Gr-III>50yrs (n=66, M:F=26:40)

In another study (2) n=40 M: F=20:20 Gr-I: 25-30 yrs (M: F=10:10) &Gr-II: 55-65yrs (M: F=10:10), Levels of VitD was assayed in deficient individuals before and after supplementation, Deficiency of VitD were orally supplemented for 8 weeks (60,000 IU/week) to normal.

Serum Vit D was assayed by Competitive Electro chemiluminescence immunoassay in Roche e411

III. RESULTS

In study (1) Vit D levels (ng/ml) in labourers: M: 30.23±7.53 & F: 28.78±6.04; Mean: 29.70±6.95. Health check-up persons Gr-I M: 12.90±3.36 & F: 16.10±5.86; Gr-II M: 16.99±6.50 & F: 15.46±5.40; and Gr-III M: 16.141±7.04 & F: 15.39±5.43. Mean: Gr-I: 14.58±4.99, Gr-II: 15.87±5.90 &Gr-III: 15.71±6.023(Office working individuals vs. labourers, p<0.0001; but no significant difference between different age groups in office working individuals).

In study (2) in relation to supplementation Gr-I: 8.96±0.96 after 8weeks 31.59±2.90; Gr-II: 5.12±1.27 after 8weeks 31.78±1.34 (before vs. after supplementation, p<0.0001). But after 08 weeks were Vit D supplement was discontinued, Gr-I=7.05±1.00& Gr-II=9.0±3.00 (no significance between initial vs. after discontinuation) .

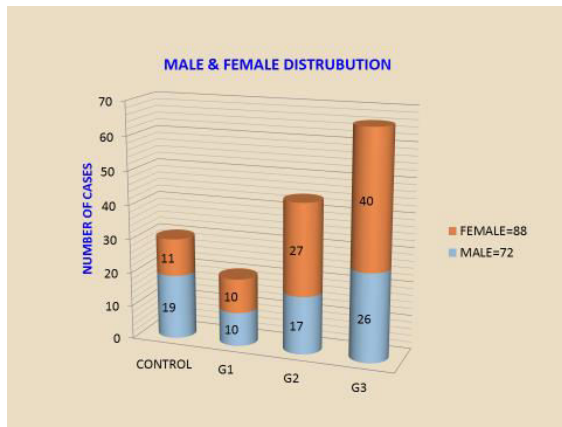


Figure :1 male to female ratio

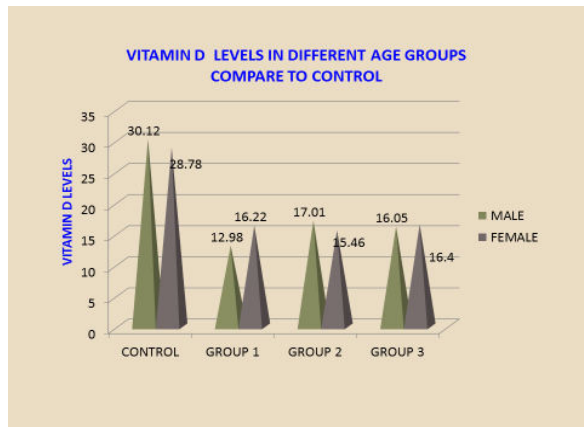


Figure 2: Vit D levels in different age groups

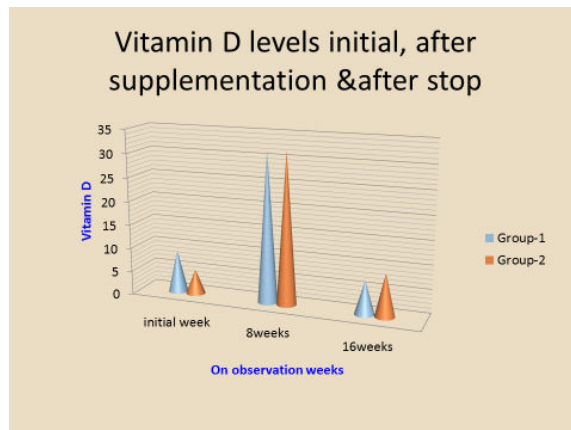


Figure 3: Vit D levels in initial, after supplementation & stop supplementation

IV. DISCUSSION

Although we are aware 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 the Indian population live in areas with adequate sunlight throughout the year and are expected to have adequate Vitamin D. Contrary to this; the prevalence of Vitamin D deficiency is high in India.

This is due to the skin complexion, poor exposure to sunlight, sunscreen creams, Indian dietary habits and lower intake of Vitamin D fortified foods¹⁰. Indians are mostly vegetarians and Vitamin D rich foods are of animal origin. All the above-mentioned factors can be a cause in urban population. However, the rural population, who by the virtue of their occupation have sufficient sunlight exposure, too have low Vitamin D levels. This can be due to the high phytate and low calcium diet they consume. Phytate rich diet is known to reduce the intestinal absorption of calcium. Hence, low dietary calcium increases the catabolism of 25(OH) D and increases the inactive metabolites with the resultant reduction in 25(OH)D concentrations^{11,12}.

Some of causes for deficiency of Vitamin D in Our country can be¹³

- Increased indoor lifestyle, thereby preventing adequate exposure to sunlight. This is mainly in the urban population due to modernization.
- Pollution can hamper the synthesis of Vitamin D in the skin by UV rays[10]



- Changing food habits contribute to low dietary calcium and Vitamin D intake
- Phytates and phosphates which are present in fiber rich diet, can deplete Vitamin D stores and increase calcium requirement[11]
- Increased skin pigmentation and application of sunscreens
- Cultural practices such as the burqa and purdah system[9]
- Unspaced and unplanned pregnancies in women with dietary deficit can lead to worsening of Vitamin D status in both mother and child.

This calls for appropriate and concrete public health action. The following measures can be taken to reduce the burden of the disease.

- Food fortification with Vitamin D is the best option to address this issue. All grades of milk can be fortified. Oil and milk products such as curd, yogurt, infant formulas, and butter can be fortified with Vitamin D. Widely consumed food items such as atta, maida, and rice flour can also be fortified. Vitamin D fortified food items should be made available to the public at minimal cost and be included in the public distribution system. Effective legislation is required to ensure this. Sustained political and administrative will and support are a must for the development of a fortification program. In India, Vanaspati (dalda) is fortified with 200 IU of Vitamin D per 100 g. Milk products of certain brand are also fortified with Vitamin D
 - Educational programs are a must to create awareness about Vitamin D deficiency as it is the most underdiagnosed and undertreated nutritional disease. Both physicians and the public should be made aware of its implications. To develop, launch and sustain such a program, adequate investment in the form of time, money, and effort is required
 - Vitamin D supplements of good quality should be made available at PHC level for the population at risk, i.e., pregnant women, lactating women, children, and elderly
 - Revision of RDA for Vitamin D by ICMR is needed as it is less compared to other guidelines
 - School going children can be benefitted from the following: educating them about the need for Vitamin D sufficiency and healthy lifestyle; providing Vitamin D fortified foods at mid-day meals in schools; daily physical exercise which would ensure exposure to sunlight.
 - Testing facilities for Vitamin D levels should be made affordable and accessible to those at high risk of clinical Vitamin D deficiency (pregnant women, children, elderly especially women), as mass screening is not feasible
 - Government should support research groups to study and monitor the impact of supplementation programs and fortification strategies.

V. CONCLUSION

This study infers that serum Vit D levels are not dependent on age and sex. Healthy working individuals have one and a half levels, compared to that of the labourers group and hence, dietary source is inferior to continued good sunlight exposure. After 08 weeks of Vit D oral supplementation levels reported for health individuals were normal; but after 08 weeks' discontinuation, the levels returned back to pre-supplement levels, thus, exposure is necessary and not one-time situation of monitoring supplementation.

REFERENCES

1. Sharman IM. Vitamin D: Anti-rachitic factor and kidney hormone. *Nutr Food Sci.* 1975;75:4–7. [Google Scholar]
2. Houghton LA, Vieth R. The case against ergocalciferol (Vitamin D₂) as a vitamin supplement. *Am J Clin Nutr.* 2006;84:694–7. [PubMed] [Google Scholar]
3. Holick MF. Vitamin D: A millenium perspective. *J Cell Biochem.* 2003;88:296–307. [PubMed] [Google Scholar]



4. Kumar V, Abbas AK, Aster JC. Robbins Basic Pathology. Environmental and Nutritional Diseases. 9th ed. Philadelphia: Elsevier Saunders; 2013. pp. 438–41. [Google Scholar]
5. Holick MF. The Vitamin D epidemic and its health consequences. *J Nutr.* 2005;135:2739S–48S. [PubMed] [Google Scholar]
6. Holick MF. Vitamin D deficiency. *N Engl J Med.* 2007;357:266–81. [PubMed] [Google Scholar]
7. Willet W. Nutritional epidemiology. In: Willet W, Lenart E, editors. *Biochemical Indicators of Dietary Intake.* 3rd ed. New York: Oxford University Press; 2013. pp. 178–82. [Google Scholar]
8. Dawson-Hughes B, Heaney RP, Holick MF, Lips P, Meunier PJ, Vieth R, et al. Estimates of optimal Vitamin D status. *Osteoporos Int.* 2005;16:713–6. [PubMed] [Google Scholar]
9. Ajmani SN, Paul M, Chauhan P, Ajmani AK, Yadav N. Prevalence of Vitamin D deficiency in burka-clad pregnant women in a 450-bedded maternity hospital of Delhi. *J ObstetGynaecol India.* 2016;66:67–71. [PMC free article] [PubMed] [Google Scholar]
10. Babu US, Calvo MS. Modern India and the Vitamin D dilemma: Evidence for the need of a national food fortification program. *MolNutr Food Res.* 2010;54:1134–47. [PubMed] [Google Scholar]
11. Harinarayan CV, Ramalakshmi T, Prasad UV, Sudhakar D, Srinivasarao PV, Sarma KV, et al. High prevalence of low dietary calcium, high phytate consumption, and Vitamin D deficiency in healthy South Indians. *Am J ClinNutr.* 2007;85:1062–7. [PubMed] [Google Scholar]
12. Clements MR, Johnson L, Fraser DR. A new mechanism for induced Vitamin D deficiency in calcium deprivation. *Nature.* 1987;325:62–5. [PubMed] [Google Scholar]
13. P Aparna,¹ S Muthathal,¹ Baridalyne Nongkynrih,¹ and Sanjeev Kumar Gupta¹ *J Family Med Prim Care.* 2018 Mar-Apr; 7(2): 324–330.



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