



Vitamin D: Is There a New Era?

Reza Amani; PhD, R Nutr^{*1} & Nasrin Sharifi; PhD²

¹ Food Security Research Center, Department of Clinical Nutrition, School of Nutrition and Food Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

² Research Center for Biochemistry and Nutrition in Metabolic Diseases, Kashan University of Medical Sciences, Kashan, Iran.

ARTICLE INFO

MINI REVIEW

Article history:

Received: 11 Feb 2017

Revised: 11 Mar 2017

Accepted: 22 Apr 2017

*Corresponding author:

r_amani@mail.mui.ac.ir

Food Security Research
Center, Department of
Clinical Nutrition, School of
Nutrition and Food, Sciences,
Isfahan University of Medical
Sciences, Isfahan, Iran.

Postal code: 8916188637

Tel: +98 916 313 9856

ABSTRACT

Background: In recent decades, much interest has been focused on investigating new roles of vitamin D in human body beyond the mineral-ion homeostasis. **Methods:** By searching medical databases such as PubMed, over 16000 articles were found which have been published since 2000 on novel aspects of vitamin D in health and diseases. **Results:** Of great interest was the effects of vitamin D on decreasing the risk of several chronic illnesses, including common cancers, autoimmune, infectious, and cardiovascular diseases. In this review, the new roles of vitamin D that have recently been investigated were addressed. **Conclusions:** Due to the vast prevalence of vitamin D deficiency worldwide, it seems that time has come to conduct well-designed clinical trials and meta-analysis to explore the effectiveness of vitamin D supplementation in treatment of common diseases. Finally, the progression in cellular and molecular methods and technology will shed new lights on vitamin D roles in health and disease.

Keywords: Vitamin D; Antioxidant; Inflammation; Gastrointestinal diseases; Depression

Vitamin D and chronic inflammation

Recently, non-calcemic functions of vitamin D, especially anti-inflammatory and immunomodulatory effects have attracted much attention. The beneficial effect of vitamin D intake on high-sensitive C-reactive protein (hs-CRP) was investigated in patients with non-alcoholic fatty

liver disease (NAFLD) (Figure 1) (Sharifi *et al.*, 2014). It has been found that 1,25(OH)₂D inhibits the T-helper1 response and may promote T-helper2 response, in other words, it could reduce production of inflammatory cytokines and induce anti-inflammatory response (Cantorna *et al.*, 2004).

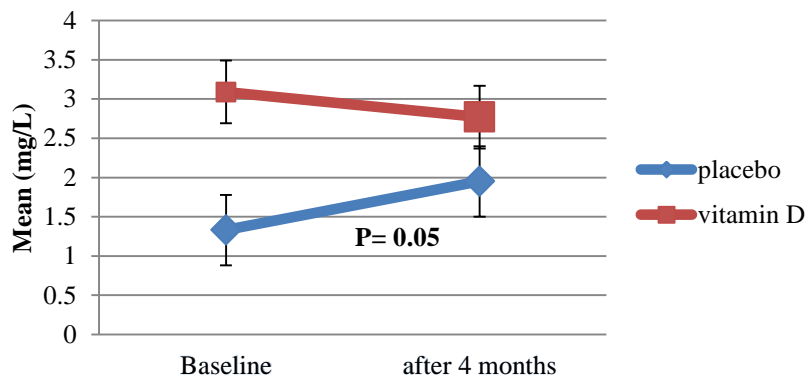


Figure 1. Mean serum levels of hs-CRP at the baseline and after supplementation with vitamin D compared with placebo in patients with NAFLD.

Antioxidant effects of vitamin D

The antioxidant role of vitamin D was initially proposed by Wiseman in 1993; it was shown that vitamin D₃ and its active form 1,25(OH)₂D₃ inhibited iron dependent liposomal lipid peroxidation (Wiseman, 1993). The structural similarity of vitamin D compounds to cholesterol

and ergosterol suggested for their membrane antioxidant ability (Wiseman, 1993). For the first time, it was found that improving vitamin D status in NAFLD patients could effectively reduce serum levels of Malondialdehyde (MDA) (**Figure 2**) (Sharifi *et al.*, 2014).

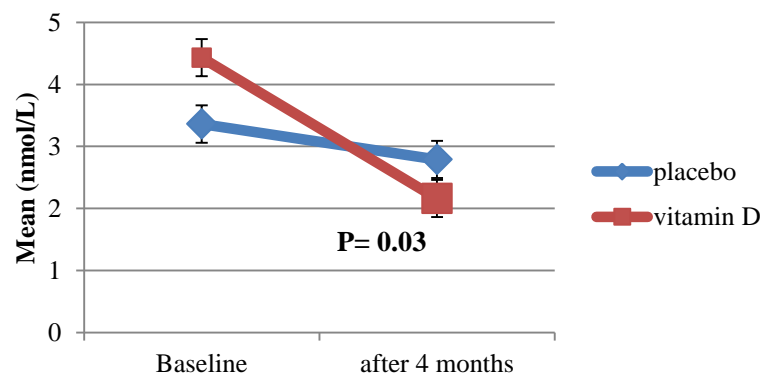


Figure 2. Mean serum levels of MDA at the baseline and after supplementation with vitamin D compared with placebo in patients with NAFLD.

It was reported in recent clinical studies on pregnant women that vitamin D supplementation could increase the serum total antioxidant capacity and glutathione levels (Asemi *et al.*, 2013). However, no association was found between 25(OH)D levels and activities of serum antioxidant enzymes in the study that assessed the relation between serum vitamin D levels and body

antioxidant status in ischemic stroke patients (Afshari *et al.*, 2015).

Vitamin D and gastrointestinal diseases

Cumulative evidence has implicated the roles of vitamin D deficiency in increasing susceptibility to various gastrointestinal (GI) disorders, including colorectal disease, inflammatory bowel diseases (IBD), and irritable bowel syndrome (IBS)

(Ferguson *et al.*, 2016). A high risk of IBD has been associated with deficient or insufficient levels of vitamin D, unhealthy lifestyle, as well as presence of vitamin D related genetic polymorphisms (Basson, 2014). IBS is also a functional GI disorder. In this regard, it was demonstrated for the first time that supplementation with 50,000 IU vitamin D₃ every 14 days for 6 months improves the quality of life and clinical symptoms of patients with IBS (Abbasnezhad *et al.*, 2016).

Vitamin D and depression

Vitamin D modulates the hypothalamic-pituitary-adrenal axis, regulating adrenalin, noradrenaline, and dopamine production through vitamin D receptors (VDRs) in the adrenal cortex and protects against the depletion of dopamine and serotonin centrally (Spedding, 2014). Therefore, a biological plausibility has been established for vitamin D effect on depression. Efficacy of vitamin D supplements in depression is controversial, awaiting further literature analysis. Premenstrual syndrome (PMS) is a condition with episodes of physical and psychological signs (Freeman, 2003). Based on the possible roles mentioned above, it seems that vitamin D status is associated with PMS

severity. However, there are a limited number of studies assessing the association of vitamin D with this condition. Thus, a cross-sectional study was designed to compare the nutritional status of vitamin D in young students affected by PMS with those of normal participants. The results, however, showed no significant differences in serum levels of vitamin D between the two groups (Saeedian Kia *et al.*, 2015). Further studies will reveal more facts in this area.

Conclusions

In summary, vitamin D may exert important roles in prevention and treatment of many chronic diseases. As a result, it is necessary to maintain the sufficient serum levels of vitamin D among community members through food fortification and supplementation.

Due to the vast prevalence of vitamin D deficiency worldwide, it seems that time has come to conduct well-designed clinical trials and meta-analysis to explore the effectiveness of vitamin D supplementation in treatment of common diseases.

Finally, the progression in cellular and molecular methods and technology will shed new lights on vitamin D roles in health and disease.

References

- Abbasnezhad A, et al.** 2016. Effect of vitamin D on gastrointestinal symptoms and health-related quality of life in irritable bowel syndrome patients: a randomized double-blind clinical trial. *Neurogastroenterol & Motility*. **28** (10): 1533-1544.
- Afshari L, Amani R, Soltani F, Haghighizadeh MH & Afsharmanesh MR** 2015. The relation between serum Vitamin D levels and body antioxidant status in ischemic stroke patients: A case-control study. *Advanced biomedical research*. **4**: 213.
- Asemi Z, Samimi M, Tabassi Z, Shakeri H & Esmailzadeh A** 2013. Vitamin D supplementation affects serum high-sensitivity C-reactive protein, insulin resistance, and biomarkers of oxidative stress in pregnant women. *Journal of Nutrition*. **143** (9): 1432-1438.
- Basson A** 2014. Vitamin D and Crohn's disease in the adult patient: a review. *Journal of parenteral and enteral nutrition*. **38** (4): 438-458.
- Cantorna MT, Zhu Y, Froicu M & Wittke A** 2004. Vitamin D status, 1, 25-dihydroxyvitamin D₃, and the immune system. *American journal of clinical nutrition*. **80** (6): 1717S-1720S.
- Ferguson LR, Laing B, Marlow G & Bishop K** 2016. The role of vitamin D in reducing gastrointestinal disease risk and assessment of individual dietary intake needs: Focus on genetic and genomic technologies. *Molecular nutrition & food research*. **60** (1): 119-133.
- Freeman EW** 2003. Premenstrual syndrome and premenstrual dysphoric disorder: definitions and

diagnosis. *Psychoneuroendocrinology*. **28** (supple 3): 25-37.

Saeedian Kia A, Amani R & Cheraghian B 2015. The association between the risk of premenstrual syndrome and vitamin D, Calcium, and magnesium status among University students: A case control study. *Health promotion perspectives*. **5** (3): 225-230.

Sharifi N, Amani R, Hajiani E & Cheraghian B 2014. Does vitamin D improve liver enzymes, oxidative stress, and inflammatory biomarkers in adults with non-alcoholic fatty liver disease? A randomized clinical trial. *Endocrine*. **47** (1): 70-80.

Spedding S 2014. Vitamin D and depression: a systematic review and meta-analysis comparing studies with and without biological flaws. *Nutrients*. **6** (4): 1501-1518.

Wiseman H 1993. Vitamin D is a membrane antioxidant Ability to inhibit iron-dependent lipid peroxidation in liposomes compared to cholesterol, ergosterol and tamoxifen and relevance to anticancer action. *Federation of European biochemical societies (FEBS) letters*. **326** (1): 285-288.