



## Vitamin D - A Fundamental Paradigm Shift in Pediatrics?

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Vitamin D deficiency/insufficiency in reality is a pandemic that is frequently undiagnosed and untreated [1-3] Research findings to date appear persuasive enough for clinicians to reconsider current clinical applicability of vitamin D supplementation.

The major source of vitamin D3 (cholecalciferol) in the body is an endogenous, naturally occurring phytochemically produced steroidal molecule. This is biologically inactive and requires enzymatic conversion to active metabolites. The plant source vitamin D2 (ergocalciferol) is less efficient and more toxic. and will not be referred to in this paper. Vitamin D3 is converted enzymatically in the liver to 25-hydroxyvitamin D (25[OH]D), the major circulating form of vitamin D, and then in the kidney to 1,25-dihydroxyvitamin D, the active form of vitamin D.

In pediatrics, vitamin D deficiency typically presents in a hospital setting with either a history of hypocalcaemic seizures in infancy, rickets or with delayed gross motor milestones in toddlers. Other clinical characteristics of vitamin D deficiency in children and adolescent may include conditions such as prematurity, cystic fibrosis, obesity, metabolic syndrome, intestinal malabsorption syndromes, respiratory and gastrointestinal infections.

Vitamin D receptors have now been discovered in tissues other than the gut and bone. These include the brain, breast, prostate and lymphocytes. The earlier role of vitamin D only as a "bone nutrient important only for the prevention of rickets and osteomalacia" has now been expanded to include an important endocrine function.

The role of vitamin D from recent research also include diverse essential functions in systemic homeostasis and physiology, calcium metabolism, intestinal barrier supporting anti-inflammatory effect, anti-viral replicative effects, cell proliferation, cardiovascular dynamics, immune/inflammatory balance, neurotransmitter/neurologic function [4] and genetic expression. Deficiency of this molecule can result in myriad of perturbations in cellular function that promote not only the manifestations of subacute long-latency deficiency diseases such as rickets osteoporosis/osteomalacia but also a wide range of diseases that include cardiovascular disease, hypertension, type I diabetes, insulin resistance, autoimmune diseases (including SLE), epilepsy [5,6] depression, migraine, polycystic ovary syndrome, musculoskeletal pain and even cancers (breast, prostate, colon). It follows that Vitamin D should now be considered for both prevention and adjunctive treatment of these medical conditions as well. This novel concept must be accepted by clinicians in order for them to understand the potential therapeutic and prophylactic uses in these disease conditions [7].

Vitamin D deficiency has been linked to a reduction in the severity and frequency of viral infectious diseases including acute pneumonia in children [8,9]. Patients who are severely deficient in vitamin D will benefit from the preventive effects if they receive adequate supplementation. It is not surprising that many studies have also suggested the protective effects of adequate vit D level in hospitalised adult patients with Covid-19 illness [10,11].

Vitamin D deficiency can be caused by a lack of sun exposure, dark complexion, sedentary lifestyle and inadequate nutritional

consumption. Current supplementation research data has flaws. This and also the enlarged role of vitamin D that has been highlighted have to be further clarified by well-designed clinical and fundamental research efforts. However a large body of evidence gathered over many years from laboratory studies, clinical trials and epidemiological surveys supports a wide range of clinical applications for vitamin D supplementation. Oral supplementation of Vitamin D in the range of 1,000 IU/day infants, 2000 IU/day for children and 4,000 IU/day for adults is safe and reasonable to meet physiologic demands to promote optimal health and to reduce the risk of severe diseases. To assure safety and effectiveness, periodic monitoring of serum 25(OH) D and serum calcium should be done.

Vitamin D is clearly not a panacea but it is an important, safe and inexpensive adjuvant therapy for the many childhood diseases discussed including pregnancy. Lastly in view of the high prevalence of Vitamin D deficiency public health efforts which include healthy lifestyle, food-based strategies and supplementation should be promoted.

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