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Vitamin D Reduces by Half the Risk of Viral Infections: A Case Study of the Novel 2019 Coronavirus Disease

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Introduction

The new outbreak of SARS-COV-2 is causing an important pandemic affecting a large number of people worldwide. Hypovitaminosis D is common in winter (October to March) at northern latitudes above 20 degrees North, and from April to September at southern latitudes beyond 20 degrees below the equator [1]. In the case of China, Wuhan city, the first outbreak occurred in winter. A time when vitamin was at its lowest. In addition, case fatality increased with age and with chronic disease comorbidity both of which are associated with hypovitaminosis [2]. Vitamin D is a hormone precursor produced by our own body with the help of sunlight which has an important role adaptive immunity and cellular differentiation, maturation and proliferation of several immune cells. Reduced levels of vitamin D in calves were signaled out to be the main cause of Bovine Coronavirus infection in the past (Bem and Domachowske) [3].

Biosynthesis and activation of vitamin d in the human body

Pre-vitamin D3 is synthesized in the upper layers of the skin from 7-dehydrocholesterol by the action of Ultra Violet Light (UVL) [4]. A no-enzymatic conversion of pre-vitamin D3 into vitamin D3 (Cholecalciferol) then occurs in the lower levels of the skin. Vitamin D3 which diffuses in the blood is quickly transported by vitamin D3 Binding Protein (DBP) to the adipose tissue for storage or liver for activation (Bhattacharyya and Deluc) [5]. In liver cells, several cytochrome P450 (CYP) enzymes can catalyze the 25-hydroxylation of vitamin D3 (or plant based vitamin D2 or ergocalciferol). The product of this step, 25-hydroxyvitamin D3 is converted into the active form of vitamin D3, 1,25-dihydroxyvitamin D3 in a reaction catalyzed by CYP27B1 [6]. This 1-hydroxylation takes place primarily in the kidney (Prosser and Jones) (Figure 1).

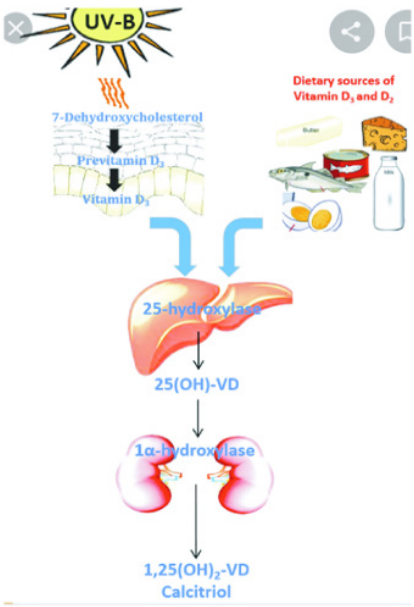

Figure 1: An illustration of the biosynthesis and activation of vitamin D.

Discussion

Currently, there is no registered treatment or vaccine for the disease. This explains the urgent need to find an alternative solution to prevent and control the replication and spread of the novel 2019 coronavirus. Preclinical research has shown that SARS-COV-2 enters the cells via the Angiotensin Converting Enzyme 2 (ACE2) [7]. Coronavirus viral replication down regulates the ACE2, thereby dysregulating the Renin-Angiotensin-Aldosterone System (RAAS) leading to a cytokine storm in the host, causing Acute Respiratory Distress Syndrome (ARDS) [8].

Furthermore, other studies have revealed that vitamin D plays a role in balancing RAAS and in reducing lung damage. These mechanisms include inducing the cathelicidins and defensins that can lower the rate of SARS-COV-2 viral replication, reduce concentration of cytokines and increase concentration of anti-inflammatory cytokines. Several observational studies and clinical trials have shown that vitamin D supplementation reduce the risk of influenza [9].

Recommendations

- Feeding on a diet that is rich in vitamin D. this includes salmon (fish), egg yolks, mushrooms and cheese among many others.
- N.B Vegetarians and vegans are at a particularly high risk of not getting enough vitamin D.
- Spend time in sunlight or using an ultraviolet lamp.
- Visit your nearest healthcare providers for professional advice on the dose of the Vitamin D supplements.
- Governments to secure proper storage facilities at their health centers where these supplements can be kept safely.

Conclusion

Daily or weekly supplementation of vitamin D has the greatest benefit for individuals with the most significant vitamin D deficiency (blood levels below 10 mg/dl)-cutting their risk of respiratory infection (COVID-19) in half-and that the participants experiences beneficial effects from regular vitamin D supplementation.

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