Annals of Journal of Environmental Science and Toxicology

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Dates: Received: 21 December, 2015; **Accepted:** 22 January, 2016; **Published:** 26 January, 2016

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ISSN: 2641-2969

www.peertechz.com

Keywords: Vitamin D; Vitamin D deficiency; Vitamin D insufficiency; Sun exposure

Short Communication

Vitamin D Deficiency: A Global Health Problem

Abstract

Vitamin D deficiency is a global health problem. The extent of vitamin D deficiency varies with latitude, season and sun exposure. Also the degree to which the body of religious or cultural reasons is covered, the skin color and, not least, dietary habits and the use of supplements has an impact on the vitamin D status. Women are more prone to develop vitamin D deficiency than men.

Vitamin D is a fat-soluble vitamin that is produced endogenously in the skin when ultraviolet rays from sunlight trigger its synthesis. For most people in the world about 90% of vitamin D is produced this way, whereas the remaining 10% is obtained from food and dietary supplements [1,2]. However, for people residing in high latitudes is the diet important to get enough vitamin D. Research has shown that increased skin pigment reduces the capacity of skin to synthesize vitamin D [3]. The main sources of vitamin D in the Norwegian diet are fatty fish, fortified butter and margarine [4], in addition to cod liver oil [5].

The vitamin D that is produced in the skin or obtained from the diet and supplements is biologically inert in the body, and must undergo two hydroxylations to be activated. The first hydroxylation occurs in the liver and converts vitamin D to 25-hydroxy vitamin D (25(OH)D, calcidiol). Next, the kidneys hydroxylate this metabolite to 1,25-dihydroxy vitamin D (1,25(OH)2D, calcitriol), the biologically active form of vitamin D. Many cells in other organ systems in the human body have vitamin D receptors, and some of these also convert 25(OH)D to 1,25(OH)2D [6]. The concentration of 25(OH) D measured in blood samples is a recognized measure of vitamin D status. The half-life is a few weeks [7].

Vitamin D deficiency is worldwide a prevalent health problem and has health impacts on about one billion people [8]. Deficiency or insufficiency of vitamin D is common in the US population, mainly because of inadequate dietary intake, sedentary lifestyles, and reduced sun exposure [2,9,10].

It has been estimated that ≥20 ng/mL is the serum level of 25(OH) D that covers the vitamin D needs of 97.5% of the population [11,12]. Serum levels less than this are considered as a vitamin D deficiency while levels <30 ng/mL is viewed as insufficient (Ross 2011, Wacker and Holick 2013). Some researchers have considered that 50 or 75 ng/mL is an optimal level [1,9,13].

Vitamin D promotes calcium absorption in the gut [14], maintains adequate serum calcium and phosphate concentrations, and enables a normal mineralization of bone. It is very important for bone growth, bone remodeling by osteoblasts and osteoclasts, and neuromuscular function [11,15]. A sufficient level of vitamin D in the body prevents hypocalcemic tetany [16], rickets in children, and osteomalacia in adults [17,18]. Together with calcium, vitamin D also helps to protect older adults from osteoporosis [11,19].

Vitamin D plays an important role in brain homeostasis, neurodevelopment, immunological modulation, aging, and also, importantly, in gene regulation [20,21]. It binds to more than 2700 genes and regulates the expression of more than 200 of them [22,23].

Research indicates a possible connection between vitamin D and a broad range of non-skeletal disorders, including dementia, autism, schizophrenia, depression, muscle pain, cardiovascular disease, diabetes, multiple sclerosis, cancer, and infections, and all-cause mortality [21,23-29].

Research has shown that vitamin D deficiency occurs in all parts of the world [2,9,10,30]. There is evidence that significant vitamin D deficiency (<25 nmol/L) is very common in all age groups in South Asia and the Middle East [31]. In a Canadian study it was found an average level of 24.6 nmol/L in female immigrants from the Middle East [32]. In a study from the United Arab Emirates had 84% of men and 89% of women vitamin D insufficiency in the winter period. In the same study had 30% of men and 46% of women vitamin D deficiency [33].

Gender was in a recent Jordanian study found significantly associated with vitamin D deficiency [30]. More females than males in the study had vitamin D deficiency. Other studies have also shown that women more often than men develop vitamin D deficiency [33-35]. Childbirthing women and women that have given birth to many children, as well as those who of religious or cultural reasons cover the whole or parts of the body when they go out, or are mostly staying inside, are particularly vulnerable to develop vitamin D deficiency [35].

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Citation: *Bjørklund G (2016) Vitamin D Deficiency: A Global Health Problem. Ann Environ Sci Toxicol 1(1): 023-024.*
DOI: https://dx.doi.org/10.17352/aest.000004