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SCIENTIFIC JOURNAL
OF MEDICAL RESEARCH

Vol. 6, Issue 24, pp 32-36 , 2022

ISSN: 2520-5234

REVIEW ARTICLE

A Review Study Of Research Conducted On Vitamin D

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ARTICLE INFORMATIONS

Article history:

Received: 7 October 2022

Revised: 13 November 2022

Accepted: 21 November 2022

Published: 24 December 2022

Keywords:

vitamin D, Physiology of vitamin D, Classification of Vitamin D, Vitamin D's medical effects, Recommendations for vitamin D

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ABSTRACT

One of the most popular subjects right now in academia, medicine, and general culture is vitamin D. Over the past few decades, Researchers have amassed a mountain of evidence to support their contention that the widespread lack of vitamin D not only has a harmful impact on the human skeletal system but also contributes to the development and progression of a wide range of contemporary diseases, including cancer, diabetes, autoimmune disorders, and cardiovascular illnesses. Eight thorough reviews that make up this Special Issue's "Vitamin D and Human Health" overview recent developments in our knowledge of vitamin D's pleiotropic effect. Eight publications offer fresh perspectives on vitamin D research and point to emerging areas. Vitamin D controls the metabolism of calcium and phosphate and preserves a healthy, mineralized skeleton. As an immunomodulatory hormone, it is also known.

INTRODUCTION

The group of fat-soluble vitamins known as vitamin D is in charge of calcium and phosphate absorption through the digestive tract.[1] Vitamin D is available in two different forms. Ergocalciferol, or vitamin D2, is a nutrient found in plants formed when ergosterol is exposed to ultraviolet B radiation. It can be obtained in fortified meals and supplements.[2] On the other hand, vitamin D3 (cholecalciferol), which is produced when 7-dehydrocholesterol is exposed to ultraviolet B light, either comes from supplements or is created in the human epidermis.[2] Vitamin D deficiency has been linked to a multitude of bone problems, including rickets, fractures, and

CITATION: Ali EH, Al-Ghanimi HH, Mohammed RK, Al-dedah RM, Alawdi BW. "A Review Study Of Research Conducted On Vitamin D". Sci. J. Med. Res. 2022;6(24):32-36. DOI: 10.37623/sjomr.v06i24.07

falls.[3-5] According to a growing body of studies, vitamin D may be beneficial in the prevention or treatment of a wide range of illnesses, including multiple sclerosis, autoimmune diseases, infections, cardiometabolic, and cancer outcomes.[6-11] It is well knowledge that rickets and osteomalacia may be brought on by a lack of vitamin D in the body. Vitamin D is an important component in the formation of bones and mineral metabolism.[12-14] Due to the widespread presence of vitamin D receptors in skeletal and non-skeletal tissues and cells, several investigations have been conducted into the vitamin's possible effects.[15-19] Low levels of 25-hydroxyvitamin D (25[OH]D) have been linked in epidemiological studies to both acute and chronic illnesses. Thus, interest in vitamin D has increased. [Needs citation].[20,21] We provide a summary of the therapeutic and dietary recommendations for vitamin D in this brief narrative review. We also outline the most recent studies on vitamin D's benefits for human health, along with how it might affect patient care and issues with public health. A quick overview of the physiology of vitamin D, its effects on the body, and the recommended diets for vitamin D will be given to get things started. Following that, we will provide some pointers and recommendations on vitamin D testing and supplementation, followed by an analysis and evaluation of the research regarding vitamin D. In conclusion, we provide a summary of our results and then outline possible advances that may occur in the field of vitamin D. The 24-hydroxylation of vitamin D metabolites marks the beginning of the catabolic process for this vitamin, which ultimately results in its excretion through the urine and bile. Here is a more thorough explanation of the metabolism of vitamin D.

Physiology of Vitamin D

Because it was the fourth vitamin in the series to be identified, Many years ago, vitamin D was considered a potential rickets treatment.[22] We shall not distinguish between vitamin D3 (cholecalciferol) and vitamin D2 (ergocalciferol), the two primary isoforms, because they have a similar metabolism. According to estimates, the generation of vitamin D in the skin caused by ultraviolet B (UV-B) rays makes up around 80% of the body's supply, with dietary sources such as fish, eggs, and foods fortified with vitamin D often only contributing a small amount.[23] Natural variations in the vitamin D supply from various sources due to genetic, environmental, and lifestyle variables exist.[24-27]

Classification of Vitamin D

Serum 25(OH)D is tested and studied to classify a person's vitamin D status. By way of the hydroxylation of vitamin D, serum 25(OH)D is mostly produced in the liver. The most accurate measure to use for estimating the quantity of vitamin D that may be gotten from a variety of sources, since it has a longer half-life and a higher blood concentration than 25(OH)D (approximately 3 weeks vs. 1 day). Commonly known as calcitriol, this is the "active" form of vitamin D, 1,25-hydroxyvitamin D2 (1,25[OH]2D), or 1,25[OH]2D, has the highest affinity for the vitamin D receptor, which is highly expressed. Because kidney function or regulators of mineral metabolisms, even though some biomarkers, such as parathyroid hormone (PTH), phosphate, or fibroblast growth factor-23 (FGF-23), are better predictors of blood concentrations of 1,25(OH)2D than the availability of 25(OH) D's substrate, these biomarkers do not correctly reflect vitamin D supply. The amount of vitamin D metabolites that are free or unbound to any other molecules in the body is very small—less than 1%. This makes up a little portion of the overall. Vitamin D-binding protein is a protein that holds the majority of vitamin D metabolites (DBP). Additionally, albumin and lipoproteins have little impact on how vitamin D metabolites bind.[28] Most cells seem to be dependent on free vitamin D metabolites that can pass the cell membrane and reach the VDR located on the inside of the cell, even though certain tissues can pick up DBP-bound vitamin D metabolites through the megalin-cubilin pathway. In situations where DBP concentrations are significantly altered, such as during pregnancy, liver cirrhosis, or hormonal contraceptives, measurements of free 25(OH)D may be helpful. However, more research is needed to fully understand the therapeutic implications of free 25(OH)D. Therefore, measurements of free 25(OH)D may be useful in situations when DBP concentrations are significantly changed (such as during pregnancy, liver cirrhosis, or the use of.[28,29]

Vitamin D's Medical Effects

Due to its effects on the gastrointestinal system, bones, and kidneys, vitamin D is essential for controlling the metabolism of calcium and phosphate. In essence, maintaining normal calcium and phosphate levels as well as preventing secondary hyperparathyroidism, depends on having a sufficient vitamin D status. Vitamin D may significantly impact bone health in this context via direct pleiotropic effects on bone cells and through proper intestinal calcium metabolism, to name just two examples. Additionally, vitamin D is crucial for maintaining the balance of minerals in the body.[30,31] The early 20th-century rickets pandemic was successfully prevented and treated thanks to the discovery of vitamin D. To do this more vitamin D was made accessible to the general people via public health initiatives, including the intake of cod liver oil, exposure to UV radiation, fortification of foods with vitamin D, and, lastly, vitamin D therapy.[32] The growth plate's decreased hypertrophic chondrocyte death and decreased mineralization are two indicators of nutritional rickets-induced bone abnormalities.[33] Rickets may be brought on by a deficiency in vitamin D in bones that still have their growth plates open, as opposed to osteomalacia, which results in reduced bone stiffness and is often accompanied by bone pain and muscle weakness.[33,34] In addition, there is a correlation between a deficiency in vitamin D and an increased likelihood of having an acute respiratory infection. There is a correlation between schizophrenia, an illness in which vitamin D deficiency is especially prevalent, and a rise in the incidence of chest ailments as well as death.[35] A low vitamin D status may be associated with several extra-skeletal consequences, such as difficulties with the immune system and

complications related to pregnancy. Since vitamin D receptors may be located in several body parts, this hypothesis seems plausible. It is widely known that vitamin D may be obtained from a select group of naturally occurring foods and via sun exposure. Because ultraviolet radiation has been identified as a recognized skin carcinogen by the American Academy of Dermatology, it is possible that obtaining vitamin D from the sun or other synthetic sources is neither safe nor efficient. Many pediatricians and other physicians, and medical professionals recommend taking the appropriate vitamin D supplements to achieve the correct plasma concentration. There is now ongoing research that is looking at the effects of vitamin D replenishment and attempting to establish the optimal blood level. In this method, individual medical advice for the addition of vitamin D should be developed.[36] They also play a role in vitamin D in maintaining placental functioning, which, as a consequence, helps avoid the appearance of late placenta-mediated disorders.[37]

On the other hand, results of randomized controlled trials and meta-analyses of vitamin D supplementation in unselected populations show either no increase or very little improvement in bone mineral density. Contrarily, significant increases in bone mineral density have been associated with using vitamin D and calcium in treating nutritional rickets and osteomalacia as opposed to the treatment for nutritional rickets and osteomalacia.[38-40] However, rickets or osteomalacia is not always related to vitamin D deficiency. This implies that additional factors, such as those relating to phosphate and calcium homeostasis, could be important in developing these diseases. A person's vulnerability to the negative effects of vitamin D deficiency may also seem to be influenced by these factors. The effects of vitamin D supplementation on the risk of falling and fracturing a bone are inconsistently reported in the available meta-analyses of randomized controlled trials (RCTs), with either a neutral or mildly favorable influence.[41,42] There has been a lot of research done to see if vitamin D has any other effects outside those it has on the musculoskeletal system. Cell culture and animal studies, together with field observations, all support the idea that vitamin D is essential for several common disorders, including infections, cancer, cardiovascular, autoimmune, and neurological issues, as well as difficulties encountered during pregnancy.[43] Numerous observational studies have shown a link between blood 25(OH) D levels and both the development of cancer and cancer-related death. Particularly interesting is the association between low vitamin D levels and cancer.[44,45]

Recommendations for Vitamin D

Various publications with vitamin D recommendations and suggestions provide varying and sometimes even contradictory information about vitamin D needs.[46,47] It is crucial to distinguish between dietary vitamin D recommendations for the general population and clinical vitamin D recommendations meant for patient treatment to prevent misunderstandings and erroneous beliefs. Given that it is created in the skin when exposed to sunlight, vitamin D is known as the "sunshine vitamin." For the health of the musculoskeletal system, blood calcium levels must be kept within the normal physiological range, which requires vitamin D. According to the Endocrine Society, the National and International Osteoporosis Foundation, and the American Geriatric Society, a 25-hydroxyvitamin (25 OH D) level less than 30 ng/mL indicates vitamin D deficiency. The Endocrine Society recommends the 40–60 ng/mL range. The Endocrine Society advises ingesting 400 to 1000 International Units (IU) daily, 600 to 1000 IU, and 1500 to 2000 IU, and accordingly, for babies under one year of age, children and adolescents between the ages of 1 and 18, and all adults to maintain this concentration. Healthcare professionals must have a general understanding of the indications, mode of action, techniques of administration, significant adverse effects, potential side effects, toxic effects, and ability to monitor for vitamin D to initiate patient treatment for therapies or vitamin supplements as a member of the interprofessional team.[48,49] No of the season, the skin's ability to synthesize vitamin D3 declines with aging, and its active forms degrade more quickly.[50]

CONCLUSION

Vitamin D is crucial for maintaining a healthy, mineralized skeleton and influencing the innate and adaptive immune systems in a way that may be useful as a supplement to therapy for many immune-mediated disorders. The presence and severity of the majority, if not all, rheumatic illnesses are related to low levels of 25(OH)D. The advantages of vitamin D supplements for the treatment and prevention of various disorders still need to be completely clear because the findings from the available clinical trials show an evident lack of consistency.

There is a clear need for both individual and population-level prevention and treatment of such low serum 25 (OH) D levels, as blood 25 (OH)D concentrations below 25 to 30 nmol/L are significantly associated with an increased risk of rickets and osteomalacia. Additionally, getting adequate vitamin D may have a minor beneficial effect on fractures and falls. These effects should only affect populations sensitive to vitamin D, such as the elderly or at-risk people with blood 25 (OH)D levels below 30 nmol/L. The declining serum 25 (OH) D concentrations may be significantly balanced by increased calcium intake. Meta-analyses of randomized controlled trials suggest that treatment may also lower extra-skeletal outcomes like infections, asthma flare-ups, pregnancy outcomes, and death rates; however, much more study is required to draw any conclusions about a relationship between the two. For any of these outcomes, if there are any factor loadings, they are insignificant but could become important in terms of population. The massive amount of vitamin D tests and well-known people must be managed by clinicians. Vitamin D testing is therefore recommended to be used only in certain people who are at high risk of vitamin D insufficiency, rather than as a general population-wide screening method. As a realistic course of action given the conflicting advice and guidelines, we advise clinicians to give vitamin D to patients

with osteoporosis and check blood 25(OH)D levels below 50 nmol/L. The majority of people should be able to safely reach blood 25(OH)D concentrations of 50 nmol/L with a daily supplement dosage of 20 g (800 IU) of vitamin D, according to some dose-response analyses of Randomized controlled trials. People who have blood 25(OH)D levels between 25 and 30 nmol/L must receive vitamin D therapy. This condition can be prevented by consuming an additional 10 g (400 IU) of vitamin D daily. The fact that the next large-scale vitamin D Randomized controlled trials did not specifically target vitamin D-deficient or vulnerable high-risk groups makes us assume that they will also fail to show any substantial beneficial benefits. However, they will provide crucial safety information for generally large doses of vitamin replacement treatment in older people. Numerous anti-aging and (photo) protective actions on the skin are brought on by vitamin D3 and its active metabolites. These are accomplished by immunomodulation, which controls keratinocyte proliferation and differentiation to provide the epidermal barrier required to preserve skin homeostasis.

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