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Special Article - Vitamin D Deficiency

Vitamin D Deficiency in Children: A Hot Topic

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Editorial

Hypovitaminosis D (insufficiency and deficiency) is a worldwide problem, affecting all ages and races.

Vitamin D is a hormone that is basically synthesized in the skin after exposure to sunlight. This substance undergoes initial hepatic (25-OH-D or calcidiol) and subsequent renal [1, 25-(OH)2-D or calcitriol] hydroxylation before the definitive functional activation. The stimulation of ultraviolet radiation (type B) promotes the endogenous synthesis of vitamin D from epidermal 7-dehydrocholesterol, which is the main source of vitamin D, whereas dietary sources account for less than 10% of the total. The characteristics of sun exposure depend considerably on the location. In this way, it has been found how the axial tilt (obliquity) of our planet in the northern hemisphere (beyond 37th parallel north), mainly in the colder months of the year, causes a change in the density of incident rays and, therefore, the ultraviolet radiation (type B) decreases up to 80–100%. Hence the main reasons of vitamin D deficiency are usually in direct relation either to any physical agents that obstruct sun radiation (cutaneous pigmentation, sunscreens, etc.) or to geographical features, such as sunlight exposure, atmospheric pollution, altitude, latitude, and the season of the year.

The role of vitamin D in bone metabolism and calcium homeostasis has been long considered and well known. Recent advances in research have shown that most tissues of human body (blood vessels, B and T lymphocytes, heart, muscles, skin, brain, mammary gland, colon, prostate, gonads, etc.) contain vitamin D receptors. This indicates additional non-calciotropic effects of vitamin D, such as its involvement in autoimmunity, chronic, infectious, metabolic and neurological diseases, and mood disorders. In fact, vitamin D is currently considered a pleiotropic hormone. In other words, in addition to its contribution to bone metabolism, vitamin D seems to fulfill a broad spectrum of biological functions related to cell proliferation, differentiation, and metabolism, which justifies the interest in monitoring its body content. Gender, age, race, season of the year in which serum is collected, sun exposure, and nutritional status have been associated with lower levels of serum calcidiol, but there are disparities among the different authors in the interpretation of these findings.

According the criteria from the US Endocrine Society, calcidiol has a long half-life (2 to 3 weeks) and is the best indicator of body vitamin D content; they consider normal serum levels when they reach 30 ng/mL or higher and hypovitaminosis D below this level. In this way, hypovitaminosis is classified into insufficiency (between 21 and 29 ng/mL) and deficiency (lower than 20 ng/mL).

Navarre is a Spanish region located on a high latitude (between 41°55′′22 N and 43°16′′42 N) with frequent cloudy and rainy days, and this characteristic is important enough to take into consideration that cyclical variation in calcidiol levels in relation to the season of the year could be explained by a possible inefficient vitamin synthesis induced by sun radiation. In fact, in our experience the body vitamin D content during the summer months was sufficient in 80% of the pediatric population (insufficiency: 14.7% and deficiency: 5.3%). They decrease in autumn (sufficiency: 34.3%, insufficiency: 49.3% and deficiency: 16.3%) and winter (sufficiency: 37.4%, insufficiency: 41.6% and deficiency: 21.1%) and falls to its lowest point in spring, when the prevalence of hypovitaminosis was 72.7% (sufficiency: 27.3%, insufficiency: 59.4% and deficiency: 13.3%). Because geographical and climatic conditions significantly influence body vitamin D content and, secondarily, PTH plasma levels, a comparison of the different results obtained in the published works from different countries and/or climatic conditions would be unwise and faulty, since the place of residence, latitude, and especially the month of the year when the blood sample is collected always have to be considered. In other words, it is not possible to establish a vitamin D status in a concrete population without considering the seasonal variations because, as this work has shown, a potential condition of hypovitaminosis D is related to the season of the year in which the determination has been made.

Given the difficulties in maintaining a sufficient body vitamin D content in the pediatric age group throughout the year, the prevention, detection, and, when required, treatment and follow-up of hypovitaminosis should be fully integrated in the programs of health promotion and disease prevention in child and adolescent population corresponding to primary health care. In other words, primary care teams and, more specifically, pediatricians should include a series of preventive measures in addition to the mandatory vitamin D daily supplementation during the first year of life, 400 UI per day, such as promoting adequate sun exposure, in the service portfolio. Around 10–15 minutes of midday sun exposure (between 10 in the morning and 3 in the afternoon) on at least 20% of total body surface (uncovered head and extremities) during spring, summer, and autumn is considered enough to get an adequate vitamin D synthesis. In addition, in case any of the hypovitaminosis D associated factors is present, especially in those individuals at risk of limited sun exposure (disabled and/or undergoing long stay in the hospital, etc.), the need for additional vitamin D supplementation should be considered, either as pharmacological supplements (600 IU per day), an increase of the ingestion of higher amounts from its natural dietary sources (herring, salmon, sardines, tuna, etc.), or vitamin D fortified foods (dairy products, cereals, etc.) during the months of winter and spring, as several authors have suggested.

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