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Understanding Vitamin D Deficiency: Insights into Epidemiology, Health Impacts, and Supplementation Options

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ABSTRACT

Vitamin D, a fat-soluble vitamin, is essential for bone health, immune modulation, and cellular growth. Uniquely, it acts as both a nutrient and hormone precursor, synthesised in the skin upon UVB sunlight exposure. It exists as vitamin D2 (from plants and fortified foods) and D3 (from animal sources and skin synthesis). Both forms are biologically inactive, requiring liver and kidney hydroxylation to convert into the active form, calcitriol (1,25-dihydroxyvitamin D).

Community-based Indian studies in the past decade reported a Vitamin D deficiency prevalence of 50-94% in healthy controls, while hospital-based studies showed 37-99%. A 2011 study by Kadam et al. on premenarchal girls in Pune (n=214) found a 34.2% prevalence. In 2017, Kapil et al. studied 1222 school children (aged 6-18 years) in Himachal Pradesh, revealing prevalence rates of 81% in Kangra and 80% in Kullu districts.

The main causes of vitamin D Modern lifestyles, urbanisation, pollution, and changing dietary habits contribute to widespread Vitamin D deficiency. Factors include limited sun exposure, fibre-rich diets with phytates, increased sunscreen use, cultural practices like the burqa system, and unplanned pregnancies in nutrient-deficient women, worsening vitamin D levels in mothers and children.

Vitamin D deficiency leads to skeletal issues like rickets, osteoporosis, and osteomalacia, and extra-skeletal effects, including depression, Parkinson's disease, suicide risk, infections, autoimmune diseases, and cancers. It also increases risks for heart disease, Type 2 diabetes, and obesity. Vitamin D regulates calcium absorption, immune function, and cell proliferation, highlighting its protective roles and therapeutic potential across various conditions.

The market offers various bioavailable vitamin D supplements, including capsules, tablets, gummies, and oral solutions. Commonly available doses range from 400 IU to 10,000 IU per serving, tailored to individual needs. These supplements address vitamin D deficiency, with cholecalciferol (D3) is the most effective and widely used form.

Vitamin D supplements, particularly cholecalciferol (D3), are vital in combating widespread deficiency, offering flexible dosing options to suit individual needs. These supplements play a crucial role in preventing and managing skeletal and extra-skeletal complications, reinforcing their importance in maintaining overall health and addressing global vitamin D insufficiency.

Keywords: Ergocalciferol, Prevalence, Vitamin cholecalciferol

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