

Vitamin D - The Neglected Vitamin

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The discovery of vitamin D, often described as the "miracle vitamin" or the "sunshine vitamin" and its impact on health initiated wide-scale food fortification in the western world 30 years ago. The developing world, however, continues to remain deprived, poverty, poor health care and lack of education compounding health issues in men, women and children alike.

Vitamin D deficiency is a global health problem in all age groups, a recent world review depicted its prevalence (<20 ng/mL) in 58% adults, 72% pregnant and lactating mothers and 71% infants in Pakistan whereas the situation in the Western world is relatively better with 20% Canadians, 34% Americans and 15-47% British exhibiting deficiency of this vitamin¹. Numerous studies in Pakistan confirm the magnitude of the problem in this country². A study conducted at Abbasi Shaheed Hospital, Karachi, measured vitamin D levels in pregnant women in labour and in cord blood of their neonates and revealed inadequate to severe vitamin D deficiency in 78% mothers and 88% new-borns at birth with a positive correlation between maternal and cord blood values³. This shocking revelation is an indicator of a severely health-deprived nation.

The formation of active vitamin D is complicated. Vitamin D₃ precursor is manufactured in the skin by an ultraviolet mediated chemical reaction

converting 7-dehydrocholesterol to pre-vitamin D₃. This enters the circulation and is converted to 25-hydroxy vitamin D₃ (25OHD) in the liver. 25OHD, manufactured in the skin and liver or achieved by ingestion is considered the best serum indicator of vitamin D status. It is subsequently converted to the active metabolite¹, 25-dihydroxy vitamin D in the kidney under the influence of parathormone. It is evident that normal liver, kidney and parathyroid function are essential for formation and utilization of vitamin D.

The effect of vitamin D on bone formation and remodelling in all age groups is well known; its deficiency is associated with low bone mineral density⁴ and increased risk of fractures but the health implications of lack of this beautiful vitamin are much more profound.

It is believed that vitamin D is the biggest regulator of the activity of the immune system, its deficiency is associated with autoimmune diseases such as rheumatoid arthritis, Crohn's disease, systemic lupus erythematosus, type I diabetes and even multiple sclerosis⁵. Severe myopathy has been attributed to its deficiency, rapid resolution occurring with correction of the problem. Its role in cancer prevention and even treatment has been postulated⁶ and is particularly important considering the global rising prevalence of carcinoma breast, colon and prostate. As vitamin D receptors are present in all body tissues, a link between its deficiency and diabetes and cardiovascular diseases has been extensively studied and it is suggested that maintenance of normal serum levels of this vitamin is of advantage in these conditions⁷. Researchers have indi-

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cated the role of vitamin D deficiency in polycystic ovarian syndrome infertility and premenstrual syndrome opening up a new dimension for research in gynaecological practice. Vitamin D levels are crucial in pregnancy and lactation, low values being associated with impaired glucose tolerance, pre-eclampsia, low birth weight, neonatal hypocalcaemic seizures and childhood asthma⁸.

It is important to understand that changing lifestyle from primitive to modern times has contributed significantly to low vitamin D status, not only because of reduced outdoor activities but because of dietary lack of the vitamin-rich oily fish, organ meats, animal fat and naturally reared poultry consumed by our ancestors. Sun avoidance along with reduced food source contribute to rising vitamin D deficiency. Vegetable diets are particularly deficient in this important vitamin. In current times, using food (unless heavily fortified with the vitamin) as the exclusive source of vitamin D is a disaster and only fishermen, farmers or otherwise regularly sunlight exposed individuals can expect to have normal vitamin D levels. It is thought that exposure of face and arms for 10-20 minutes provides only 200-400 IU of vitamin D each time⁸, whereas 85% of body surface needs to be exposed daily to achieve optimal requirements. Additionally, 10-20 minutes exposure in fair individuals is equivalent to 90-120 minutes exposure in dark-skinned individuals such as Pakistanis as melanin acts as a barrier to the conversion of 7-dehydrocholesterol to the pre-vitamin.

Serum vitamin D levels >30 ng/mL are considered sufficient in all individuals, 21-29 ng/mL insufficient and <20 ng/mL deficient. Measuring vitamin D levels is expensive but is clearly indicated in symptomatic individuals such as those suffering from muscular and bony aches and spontaneous fractures or those at risk of vitamin D deficiency. These include people with pigmented skin (non-white), use of skin concealing garments or regular sunscreen use, lack of proper daily sunlight exposure, pregnant and breast feeding women, the elderly, obese individuals, strict vegetarians, malabsorption syn-

drome and use of anticonvulsants. So, basically, serum vitamin D levels are needed in almost all Pakistanis to assess the degree of the problem so that necessary correction can be achieved.

Vitamin D values as low as 5 ng/mL or even less are seen in Pakistani obstetric practice³. Before initiating treatment, it is advisable to carry out renal function tests to exclude renal failure (active metabolite of vitamin D is formed in the kidney), liver function tests to exclude hepatic failure, parathormone level to exclude primary hyperparathyroidism and calcium to exclude hypercalcaemia. In practice, simple renal function tests, alanine transaminase and calcium tests suffice. In the presence of normal liver and kidney function, it is safe to initiate therapy.

Whereas recommended normal dietary allowances are currently 400 IU for breastfed infants⁹ 600 to 1000 IU for adolescents¹⁰, 1000 IU in pregnancy⁸ and 800 IU in elderly, the treatment regimens are much higher. For severe deficiency state (vit D <10ng/mL), 3 injections of vitamin D (600,000 units) intramuscularly at 1-month intervals can be administered. Alternatively, oral injections/capsules vitamin D (200,000 units) can be given weekly for 9 weeks. Although some concerns have been expressed about the high dose intramuscular injections because of the rapid rise in peak values, it has the advantage of good compliance, very low cost and immediate administration. It is certainly worth considering in high risk, depleted individuals. Treated individuals need yearly booster doses for life as values will taper unless oral doses of at least 2000 IU/day or more are ingested. The fear of vitamin D intoxication (which occurs if serum levels are greater than 100 ng/mL) is irrational if the suggested schedule is followed after assessing vitamin D status.

The magnitude of the problem of vitamin D deficiency is still underestimated in Pakistan as no large-scale study encompassing all communities has been conducted. Physicians continue to share clinical problems ranging from severe muscle aches, extremely low bone mineral density and

spontaneous fractures to infantile bony deformities, depression, auto-immune diseases and reproductive health issues. National guidelines for requirements in different age groups and at different stages of life need to be developed as well as wide-scale fortification of cereal and dairy products. These public health interventions are essential for the sake of the health of our future generations.

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