Deficiency of Vitamin D among Females of Northern India

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ABSTRACT: Vitamin D is one of many nutrients our bodies need to stay healthy. Vitamin D has been traditionally known as “anti-ricketic factor or sunshine vitamin”. It is a unique nutrient because it can be synthesized endogenously (skin) and it functions as a hormone. Apart from various other functions vitamin D helps the body to absorb calcium which keeps bone strong and healthy. All women, house bound, living in crowded localities and dark alleys, with covered-up style of clothing and purdah and thus, deprived, of sun exposure, are at the highest risk of developing vitamin D deficiency osteomalacia. Osteomalacia is the most common bone disease in Indian females. Responsible factors behind this high frequency of bone disease are nutritional inadequacy and customs and rituals in which females are supposed to completely cover their body. Moreover, milk which is main source of calcium is an expensive food in India. Deficiencies in calcium intake also compound the risk of osteomalacia. Awareness among females regarding the importance of vitamin D and healthy bones and government policies can be the better weapon to fight against osteomalacia.

KEYWORDS: Antiricketic, osteoblasts, osteoclasts, hypovitaminosis, osteomalacia.

I. INTRODUCTION

Bone, homeostatic and metabolically active organ, receives about 10 per cent of the cardiac output. Health of the adult skeleton and its structural integrity is maintained by bone remodelling, a process in which bone that has undergone fatigue damage from repetitive cyclical loading is replaced by new one. The damaged bone is replaced at the same location by osteoblasts (1). The balance between bone formation by osteoblast and bone resorption by osteoclast is the principle of bone remodelling (2, 3). India is located between 8.4°N and 37.6°N latitude with the majority of its population living in regions experiencing optimum sunlight throughout the year (4). In a tropical country such as India where there is abundant sunshine for most or all of the year, vitamin D deficiency is unexpected (5). Even so, hypovitaminosis D, resulting in severe osteomalacia, has been observed in adolescents in India. Inadequate intake of vitamin D and calcium may cause nutritional bone syndrome which is defined as a syndrome of bone disease and deformities in which the bone is affected as a tissue, primarily as a consequence to deficiencies of vitamin D and calcium. Osteomalacia is the most common bone disease in Indian females and is characterized by a failure to mineralize the newly formed organic matrix (osteoid) of bone in a normal manner. It occurs due to inadequate exposure to sunlight (UVB 290-315nm) in the females who had depleted their bone, minerals and vitamin D stores during repeated pregnancies and prolonged lactations (1).

II. HYPOVITAMINOSIS D IN INDIA AS PARADOX

The deficiency of vitamin D among Indian females is a paradox and this paradox may be partly explained by the many prevalent social and cultural practices in India that preclude adequate exposure of adolescent girls and young women to
sunshine. Revealing clothing is frowned on in traditional Indian households, both rural and urban (6). Newly married females are expected to cover themselves even more and are discouraged from outdoor activity makes them deprived of sun exposure, and are at the highest risk of developing vitamin D deficiency osteomalacia. Increasing urbanization that results in poor outdoor activity and greater pollution may further increase this problem (7).

i) Aetiopathogenesis
An important misconception about vitamin D-deficiency osteomalacia is that it results due to skin pigmentation, vegetarian diets, and consumption of unleavened chapattis made of high extraction wheat flour rich in fibre and phytate contents (8). Researchers (9, 10,11) performed separate measurements for skin synthesized vitamin D3 and dietary vitamin D2 and demonstrated that the contribution of dietary vitamin D in normal women of child bearing age was negligible i.e.: found to be less than 8 percent. Over 92 percent of total circulating vitamin D was endogenously synthesized following exposure to sunlight (UV B290-315nm) and confirmed the marginal and negligible role of dietary vitamin D (12, 13).

III. VITAMIN D DEFICIENCY AMONGST INFANTS AND NEW BORN
Vitamin D is essential for women as this increase fertility, prevent polycystic ovarian syndrome, prevent breast cancer, increases immunity and makes bone stronger. Vitamin D deficiency occurs in children when the mother is vitamin D deficient (14). Low levels (<10 ng/mL) were recorded amongst study- infants with hypocalcemic seizures (90%), and control- infants (41.7%) in a hospital based study. Mean serum vitamin D values of study infants (6.54 ± 5.32 ng/ml) were significantly lower than those of healthy breastfed infants (9.06 ± 4.78 ng/ml) (15). In a study conducted amongst infants, mean vitamin D levels were found to be 11.55 ± 7.17 ng/ml at 10 weeks and 16.96 ± 13.33 ng/ml at 6 months and by 6 months, 16.49% infants developed rickets (16). A high prevalence of vitamin D deficiency (86%) in healthy term born infants at the age of 3 months was also found (17).

i) VITAMIN D DEFICIENCY AMONGST FEMALES BETWEEN 6-18 YEARS OF AGE
Study conducted amongst school girls, reported the prevalence of Vitamin D deficiency as 70% and mean serum vitamin D level as less than 12ng/ml (18). Another study on girls aged between 6-18 years belonging to both lower and upper socio economic status, documented the prevalence of biochemical hypovitaminosis D (<50 nmol/ml) as 90.8% of the population. Other study conducted on 6-17 years schoolgirls from both and different socio economic status reported the prevalence of vitamin D deficiency as 93.7%. However, the prevalence of Vitamin D deficiency in lower socioeconomic strata was higher (97.3%) as compared to upper socioeconomic strata (90.9%) (19). A study conducted on obese Indian children and adolescents in the age group of 6–17 years concluded that all study subjects were vitamin D deficient. A study conducted on children of age between 10-14 years, 92.3% of children were found to be vitamin D deficient (20).

IV. VITAMIN D DEFICIENCY AMONGST PREGNANT AND LACTATING FEMALES
A study on pregnant mothers in India, revealed that 74% of the mothers had vitamin D deficiency (25OHD < 30ng/ml) (21). Low intake of vitamin D by mother in pregnancy is associated with wheeze and asthma in the offspring (22). Vitamin D deficiency has also been noted in pregnant women in tropical countries, but all studies were in Muslim populations, in whom the practice of purdah might have played an important role (23-28). Vitamin D deficient pregnant female may suffer from hypertension, low glucose tolerance whereas low birth weight and other complications may be found in new born (29, 30). Studies on pregnant mothers from southern and northern states of India have reported high vitamin D deficiency levels with values ranging from 67% to 96% (31-35). A study conducted amongst pregnant mothers in India, reported that 74% of the mothers had vitamin D deficiency (< 30ng/ml) (36).
V. VITAMIN D DEFICIENCY AMONG FEMALES OF AGE 50 YEARS AND ABOVE

Among elderly females vitamin D deficiency is related to muscle weakness (37). These people are more prone to develop vitamin D deficiency diseases because of various risk factors like decreased dietary intake, diminished sunlight exposure, reduced skin thickness, impaired intestinal absorption and impaired hydroxylation in liver and kidneys (38-40). A study conducted amongst postmenopausal women to evaluate their dietary calcium and vitamin D status documented that, 18% subjects had normal vitamin D levels (>20 ng/ml), 52% subjects had vitamin D insufficiency (10-20 ng/ml), and 30% subjects had vitamin D deficiency (<10 ng/ml) (41).

VI. CONCLUSION

In a tropical country such as India where there is abundant sunlight but still there are prevalent vitamin D deficiency diseases. Vitamin D is synthesized endogeneously and there is negligible requirement from dietary supplements. Women are generally vulnerable to undernutrition especially during pregnancy and lactation where the food and nutrient requirements are more during that period. Government should make policies regarding awareness among people about value and use of sunlight. There is need of more research regarding the causes of deficiency of vitamin D.

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