

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. HYPOVITOMINOSIS 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

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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 endogeneously 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).

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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.

REFERENCES

- 1) Teotia SPS & Teotia M, Nutritional bone disease in Indian population, Indian J Med Res, 127, pp 219-228, 2008.
- 2) Zaidi M. Skeletal remodelling in health and disease, Nature Med, 13, pp 791-801, 2007.
- 3) Cohen MM., The new bone biology: pathologic, molecular and clinical correlates, Am J Med Genetics, 140A, pp 2646-2706, 2006.
- 4) Urvashi Mehlatat, Priyanka Singh, Shubhra Pande, Current status of Vitamin-D deficiency in India, IPP, Vol 2 (2), pp 328-335, 2014.
- 5) Rajeswari J, Balasubramanian K, Bhatia V, Sharma VP, Agarwal AK, Aetiology and clinical profile of osteomalacia in adolescent girls in northern India, Natl Med J India, 16, pp 139-42, 2003.
- 6) Alok Sachan, Renu Gupta, Vinita Das, Anjoo Agarwal, Pradeep K Awasthi and Vijaylakshmi Bhatia, High prevalence of vitamin D deficiency among pregnant women and their newborns in northern India, Am J Clin Nutr, 81: 5, pp1060-1064, 2005.
- 7) Agarwal KS, Mughal MZ, Upadhyay P, Berry JL, Mawer EB, Puliyl JM, The impact of atmospheric pollution on vitamin D status of infants and toddlers in Delhi, India. Arch Dis Child, 87, 111-3, 2002.
- 8) Dunnigan MG, Childs WC, Smith CM, McIntosh WB, Ford JA. The relative roles of ultraviolet deprivation and diet in the aetiology of Asian rickets. Scottish Med J, 20, 217-8, 1975.
- 9) Teotia SPS, Teotia M. Singh KP. Epidemiology of metabolic bone disease and clinically related disorders-India, 1963-2001, Postgraduate medicine. Mumbai: The Association of Physicians of India, pp 501-14, 2001.
- 10) Teotia SPS, Teotia M, Endemic bone disease and deformities consequent to disorders in nutrition, bone and mineral metabolism and related hormones. Published report. New Delhi: Indian Council of Medical Research, pp 1-98, 1992.
- 11) Teotia SPS, Teotia M, Nutritional osteomalacia in immigrants, Br Med J, 3, pp 111, 1972.
- 12) Teotia SPS, Teotia M, Endemic bone disease and deformities consequent to disorders in nutrition, bone and mineral metabolism and related hormones. Published report. New Delhi: Indian Council of Medical Research, p. 1-111, 1996.
- 13) Poskitt EME, Cole TJ, Lawson DEM. Diet, sunlight and 25-hydroxyvitamin D in healthy children and adults, Br Med J, 1, pp 221-3, 1979.
- 14) Lips P, Worldwide status of vitamin D nutrition. The Journal of Steroid Biochemistry and Molecular Biology, 121(1-2), pp 297-300, 2010.
- 15) Mehrotra P, Marwaha RK, Aneja S, Seth A, Singla BM, Ashraf G, Sharma B, Sastry A and Tandon N, 2010 Hypovitaminosis D and Hypocalcemic Seizures in Infancy, Indian Pediatrics, 47, pp 581-586, 2010.
- 16) Agarwal N, Faridi MM, Aggarwal A and Singh O, Vitamin D Status of term exclusively breastfed infants and their mothers from India, Acta Paediatr, 99(11); 1671-4, 2010.
- 17) Jain V, Gupta N, Kalaivani M, Jain A, Sinha A and Agarwal R, Vitamin D deficiency in healthy breastfed term infants at 3 months and their mothers in India: seasonal variation & determinants, Indian J Med Res, 133(3), pp 267-71, 2011.
- 18) Khadilkar A, Das G, Sayyad M, Sanwalka N, Bhandari D, Khadilkar V and Mughal MZ, Low calcium intake and hypovitaminosis D in adolescent girls. Arch Dis Child, 92(11), pp 1045, 2007.
- 19) Marwaha RK, Tandon N, Agarwal N, Puri S, Agarwal R, Singh S and Mani K, Impact of two regimens of Vitamin D supplementation on calcium - Vitamin D - PTH axis of schoolgirls of Delhi, Indian Pediatr, 2010. 47(9), pp 761-9, 2010.
- 20) Khadgawat R, Marwaha RK, Tandon N, Mehan N, Upadhyay AD, Sastry A and Bhadra K, Percentage Body Fat in Apparently Healthy School Children From Northern India Indian Pediatrics, 50, 2013.
- 21) Sahu M, Bhatia V, Aggarwal A, Rawat V, Saxena P, Pandey A and Das V, Vitamin D deficiency in rural girls and pregnant women despite abundant sunshine in northern India, Clin Endocrinol (Oxf), 70(5), pp 680-4, 2009.
- 22) Camargo CA Jr, Rifas-Shiman SL, Litonjua AA, Rich-Edwards JW, Weiss ST, Gold DR, Maternal intake of vitamin D during pregnancy and risk of recurrent wheeze in children at 3 y of age, Am J Clin Nutr, 85, pp 788-95, 2007.
- 23) Rab SM, Baseer A. Occult osteomalacia amongst healthy and pregnant women in Pakistan. Lancet, 2, pp 1211-3, 1976.
- 24) Atiq M, Suria A, Nizami SQ, Ahmad I, Maternal vitamin-D deficiency in Pakistan, Acta Obstet Gynecol Scand, 77, pp 970-3, 1998.

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(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

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- 25) Bassir M, Laborie S, Lapillone A, Claris O, Chappuis M-C, Salle BL, Vitamin D deficiency in Iranian mothers and their neonates: a pilot study, *Acta Paediatr* 90, pp 577-9, 2001.
- 26) Brunvand L, Shah SS, Bergstrom S, Hang E, Vitamin D deficiency in pregnancy is not associated with obstructed labour: a study among Pakistani women in Karachi, *Acta Obstet Gynecol Scand*, 77, pp 303-6, 1998.
- 27) Serenius F, Eldrissy A, Dandona P, Vitamin D nutrition in pregnant women at term and in newly born babies in Saudi Arabia, *J Clin Pathol*, 37, pp 444-7, 1984.
- 28) Taha SA, Dost SM, Sedrani SH, 25-hydroxy D and total calcium: extraordinarily low plasma concentrations in Saudi mothers and their neonates, *Paediatr Res*, 18, pp 739-41, 1984.
- 29) Urvashi Mehlat, Priyanka Singh, Shubhra Pande, Current status of Vitamin-D deficiency in India, *IPP*, Vol 2 (2), pp 328-335, 2014.
- 30) Farrant HJ, Krishnaveni GV, Hill JC, Boucher BJ, Fisher DJ, Noonan K, et al. Vitamin D insufficiency is common in Indian mothers but is not associated with gestational diabetes or variation in newborn size, *Eur J Clin Nutr*, 63, pp 646-52, 2009.
- 31) Holick MF, Vitamin D deficiency, *N Engl J Med*, 357, pp 266-281, 2007.
- 32) Calvo MS, Whiting SJ and Barton CN, Vitamin D intake: a global perspective of current status, *J Nutr*, 135, pp 310-316, 2005.
- 33) Oren Y, Shapira Y, Agmon-Levin N, Kivity S, Zafrir Y, Altman A, Lerner A and Shoenfeld Y, Vitamin D insufficiency in a sunny environment: a demographic and seasonal analysis, *Isr Med Assoc J*, 12, pp 751-756, 2010.
- 34) McCollum E A, *History of Nutrition*, Houghton Mifflin Co., Boston, 1957.
- 35) Hopkins FG, The analyst and the medical man, *Analyst*, 31, pp 385-404, 1906.
- 36) Sahu M, Bhatia V, Aggarwal A, Rawat V, Saxena P, Pandey A and Das V, VITAMIN D DEFICIENCY in rural girls and pregnant women despite abundant sunshine in northern India, *Clin Endocrinol (Oxf)*, 2009. 70(5); 680-4.
- 37) Schott GD, Wills MR, Muscle weakness in osteomalacia, *Lancet*, 1, pp 626-9, 1976.
- 38) Omdahl JL, Garry PJ, Hunsaker LA, Hunt WC, Goodwin JS, Nutritional status in a healthy elderly population: vitamin D. *Am J Clin Nutr*, 36, pp 1225-33, 1982.
- 39) McKenna MJ, Differences in vitamin D status between countries in young adults and the elderly. *Am J Med*, 93, pp 69-77, 1992.
- 40) Holick MF, Environmental factors that influence the cutaneous production of vitamin D. *Am J Clin Nutr*, 61(suppl), 638S- 45S, 1995.
- 41) Harinarayan CV, Prevalence of vitamin D deficiency in postmenopausal south Indian women. *Osteoporos Int*, 16, pp 397-402, 2005.