

Original Article

Health Science

Vitamin D deficiency in Healthy Postmenopausal Women in Haryana

Sanjay KALRA*, Bharti KALRA, Sachin Kumar KHANDELWAL

ABSTRACT [ENGLISH/ANGLAIS]

This original work assesses the vitamin D status of healthy, asymptomatic cohort of postmenopausal women in Karnal, Haryana, northern India, located at a latitude of 28°42'N. The prevalence of vitamin D deficiency is 52.37 %, while that of vitamin D insufficiency is 14.28 %. The mean serum 25(OH) vitamin D level is 21.0 ± 13.5 ng/ml. This paper highlights the high occurrence of low vitamin D levels in a prosperous state of north west India.

Keywords: Post menopause, North west India, Vitamin D deficiency

RÉSUMÉ [FRANÇAIS/FRENCH]

Ce travail original évalue le statut en vitamine D de la santé, la cohorte asymptomatiques des femmes post-ménopausées en Karnal, Haryana, nord de l'Inde, située à une latitude de 28 ° 42'N. La prévalence de la carence en vitamine D est 52,37%, tandis que celle de l'insuffisance en vitamine D est de 14,28%. Le taux sérique moyen de 25 (OH) vitamine D est 21.0 ± 13.5 ng/ml ±. Ce document met en évidence la fréquence élevée des faibles niveaux de vitamine D dans un état prospère du nord-ouest de l'Inde.

Mots-clés: Après la ménopause, à l'ouest nord de l'Inde, carence en vitamine D

Affiliations:

Bharti Hospital, Wazir Chand Colony, Kunjapura Road, Karnal, Haryana, and

Bharti Research Institute of Diabetes and Endocrinology, Wazir Chand Colony, Kunjapura Road, Karnal, Haryana, INDIA

* Email Address for Correspondence/
Adresse de courriel pour la
correspondance: brideknl@gmail.com

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INTRODUCTION

The clinical symptoms of osteomalacia, caused by vitamin D deficiency, have been known in Northern India for nearly a century [1]. North Indian physicians have reported the occurrence of this clinical condition on many occasions from many various locations as diverse as New Delhi and Meerut [2, 3, 4, 5].

In Haryana too, physicians had recognized this syndrome in women and men [4, 5]. Surprisingly, the same authors had reported the total absence of rickets in children attending the outdoor patients department of a teaching institution in the state [6]. They attributed this finding, which contrast with data from New Delhi, to the adequate sunshine exposure enjoyed by children in an environment devoid of atmospheric pollution [7].

While researchers from Haryana had identified and reported vitamin D deficiency about three decades ago, no work has been done in recent years regarding this important public health issue. Surveys have been conducted nationwide [3], but have not focused specifically on Haryana. At the same time, veterinary

researchers have ensured that numerous reports have been published on osteomalacia in cattle in Haryana [8]. Endocrinology researchers in other states, however, have been actively involved in researching this major clinical and public health problem. Over the past two decades, extensive work has been carried out to determine the prevalence of vitamin D deficiency in India. Of these studies, however, none have covered the north-western states, including Haryana. Most of the work has been carried out in healthy young adults [9, 10, 11, 12]. All these researchers report a uniformly high prevalence of vitamin D deficiency, in various groups of the population [9]. Results of various studies have been described in detail recently [9]. Only two studies, to our knowledge, have focused on vitamin D states of postmenopausal women. These have taken place in Vellore and Tirupati, both of which are in southern India [13, 14]. Postmenopausal women have been found to have low vitamin D levels in both studies reported from India. One Hundred and Fifty (150) postmenopausal women living in and around Vellore, Tamil Nadu (latitude 12.55° N and longitude 79°11'E), aged 60.1 ± 5.0 years, were

assessed for parameters related to bone health. The mean vitamin D was 20.85 ± 8.63 ng/ml [13]. 164 postmenopausal women from Tirupati, Andhra Pradesh (latitude $13^{\circ}4'N$ and longitude $79^{\circ}20'E$) aged 54 ± 8 years, were assessed in a similar fashion. The mean serum vitamin D levels were 14.6 ± 7 ng/ml [14].

While this data is convincing enough, there is a need to assess vitamin D status in other states and regions of India as well.

Haryana is a prosperous state of northwest India, which is blessed with abundant food, especially dairy products, and sunshine. Its inhabitants are fair-skinned, and enjoy a physically active lifestyle.

A very high incidence of vitamin D deficiency in patients presenting to the endocrine and metabolic OPD with musculoskeletal complaints has been reported (94.03 %) from Haryana (manuscript under preparation). However, no work has been done to assess the vitamin D status in a normal healthy cohort in Haryana.

Hence, this study was planned to assess vitamin D sufficiency in healthy post menopausal women in a district headquarter in Haryana.

MATERIALS AND METHODS

This cross sectional single centre study was performed at an endocrine center in Karnal, Haryana, northern India (latitude $29^{\circ}42'N$ and longitude $77^{\circ}02'E$) to assess the prevalence of vitamin D deficiency in asymptomatic healthy postmenopausal women. The study was conducted during summer (May- July) 2010.

Eighty four (84) subjects were recruited from relatives of patients attending the OPD for various indications. Inclusion criteria were asymptomatic women, with history of menopause for at least 1 year without known diabetes, thyroid, renal or hepatic disease or malignancy. Only patients living at the same location, within Karnal district, for at least one year were included. Patients with history of surgery, hospitalization, or major medical illness within the past one year were excluded from the study. Patients on hormone replacement therapy, glucocorticoids, bisphosphonates, teriparatide and other drugs affecting bone metabolism were excluded as well.

Intake of conventional calcium/vitamin D supplements was not considered an exclusion criterion.

All subjects enrolled after taking a written informed voluntary consent. They were subjected to a complete

history and physical examination geared towards assessing bone and mineral status.

Investigations included complete hemogram, renal and hepatic function tests, as well as fasting and postprandial blood glucose. Serum, calcium, phosphorous, alkaline phosphate, protein, albumin and globulin levels were measured. Thyroid function tests, serum parathormone and 25-hydroxyl vitamin D were also assessed.

All tests were performed after 8-12 hours of fasting. Samples were processed and the serum transported to a central laboratory for estimation within 24 hours.

Serum, calcium measured by Arsenazo III method, phosphorous by phosphomolybdate method, AST and ALT by enzymatic method, and alkaline phosphate by pNPP method

Estimation of PTH-(Intact Molecule), T3, T4 and ultra sensitive TSH was done by chemiluminescence immuno assay, serum creatinine by Jaffe method, serum protein (Total), by Biuret method, serum albumin, serum by bromocresol purple method. Serum 25-Hydroxy (OH) vitamin D was assessed by EIA/ELISA.

Sunlight exposure and dietary intake of calcium or vitamin D were not measured in this pilot study, because of lack of manpower.

RESULTS

A total of 84 postmenopausal women, accompanying their relatives to the OPD, were screened. All these subjects did not volunteer any symptoms suggestive of musculoskeletal disease on detailed history taking.

The cohort comprised of 61 urban dwellers (72.61 %) and 23 (37.38 %) rural dwellers. 71 (84.52 %) were of Hindu religion, with the rest being Sikh (15.47 %). All women were traditional Indian dress of sari or salwar-kameez. None of them observed purdah. All but 4 (4.76 %) were vegetarian. All reported their occupation as housewife, and all belonged to upper or middle socioeconomic class. The average age was $52: 80 \pm 16.12$ years (range 38 to 75 years).

None of these subjects were detected to have hepatic or renal dysfunction, based on clinical examination and biochemical investigations. 6 (7.10 %) had hemoglobin below 10 g%, while 27 (32.14 %) had hemoglobin levels ranging from 10 g% to 11.9 g%. Serum calcium and phosphorous levels were normal in all subjects. Sub clinical thyrotoxicosis was detected in six (7.10 %) and sub clinical hypothyroidism in three (3.55 %) subjects. Fasting

blood glucose levels were normal in all subjects. Impaired glucose tolerance was detected in 13(15.47 %) subjects. No subject was found to have blood glucose levels diagnostic of diabetes mellitus.

Vitamin D levels measured less than 10ng/ml in 15 subjects and between 10 and 20 mg/ml in 29 subjects. Thus, the prevalence of vitamin D deficiency was 52.37 %. 12 subjects (14.28 %) had vitamin D levels ranging between 20 and 30ng/ml. Thus the prevalence of vitamin D insufficiency was 14.28 % in this cohort of apparently healthy north Indian postmenopausal women from Haryana. Put together, 66.67 % of the subjects had deficient or insufficient vitamin D levels. (Table 1)

No difference was observed in average vitamin D levels in women from urban and rural background or in women of different religions. No subject had vitamin D levels in the "high" range, the highest value being 48ng/ml. 33.33 % had adequate vitamin D levels, measuring above 30ng/ml. The mean vitamin D was 21.0 ± 13.15 ng/ml in this cohort of healthy postmenopausal women.

Serum parathormone (intact molecule) levels were normal in all except 6 subjects (7.14 %). The highest value was 112.8pg/ml, with the mean being 30.10 ± 27.99 pg/ml.

DISCUSSION

High prevalence rates of vitamin D deficiency have been reported earlier from various Indian centers [9]. Many of these studies have been conducted in hospital personnel, who may have been predisposed to vitamin D deficiency because of poor exposure to sunlight, long working hours, and suboptimal diet and physical activity [10, 11]. Some of this work has been carried out in cities located at latitude similar to that of Karnal, Haryana.

A large study conducted during winter in New Delhi (latitude 28°35'N) revealed adequate 25 OHD levels in soldiers (47.17 nM) but very low levels in other cohorts. Physicians and nurses had the least 25 OHD levels (7.98 nM), while new born (16.72 nM) antenatal women (21.9 nM) and depigmented persons (18.2 nM) also fared poorly. Another study from Lucknow (latitude 26.55 °N) found 66.3 % of 82 'healthy' hospital staff, aged 34.2 years, to be vitamin D deficient (25 OHD < 15 mg/ml), and 20.6 % to be severely deficient (25 OHD < 5 mg/ml). The season in which the study was carried out was not reported.

Reports of low vitamin D in Asian Indian immigrants living in the United States have also been published. Indians living in Iowa have an average 25 OHD of 33 nM

as compared to 64 nM in their Caucasian neighbors [15]. Asian Indians residing in South Carolina have 25 OHD of only 13 mg/ml as compared to 30 mg/ml in Caucasians from the same state [16, 17]. Similar results are reported from the UK, which has a large population of immigrant Indians [18].

None of these studies, however, have specifically focused on postmenopausal women. As a group, postmenopausal women are more prone to metabolic bone disease including osteoporosis and osteomalacia. Their limited physical activity, choice of non-revealing clothing (in north India), minimal outdoor activity and suboptimal dietary intake of calcium and vitamin D (due to a predominantly vegetarian diet), all contribute to this predisposition [18].

No data on vitamin D deficiency has been reported from Haryana earlier. Haryana is a prosperous state of North West India, with a high per capita income (Rs. 77878 per annum). Haryana ranks second in Indian states with respect to per capita income, and has the highest number of rural millionaires in India. The average intake of milk and milk products is adequate [19]. At 660g per day, the per capita milk intake is the second highest in the country. The state prides itself as the land of dairy products. The state is known for its strong emphasis on sports, and in recent years, its sports persons have contributed to the bulk of India's medal tally at international competitions. Against such a background, the results of our study are alarming.

TABLE 1

Table 1 shows the levels of Vitamin D in the subjects

Vitamin D range	Number of subjects	Percentage of subjects
<10ng/ml	15	17.85
11-20ng/ml	29	34.52
21-30ng/ml	12	14.28
>30ng/ml	28	33.33
Total	84	100

The prevalence of vitamin D deficiency and insufficiency has been shown to be 66.67 % in asymptomatic, healthy postmenopausal women in Haryana. The frequent occurrence of this condition is in spite of better dietary intake of calcium, more sunlight exposure, or a healthier life style as compared to inhabitants of New Delhi or

Lucknow. The subjects in our study are probably more fair skinned than those in Lucknow or Tirupati, and live in an environment with less air pollution.

These results compare with an extremely high prevalence of vitamin D deficiency/insufficiency reported in symptomatic patients complaining of musculoskeletal complaints (94.03 %), hypothyroid patients (96.16 %) and fairly highly prevalence in patients with type 1 and type 2 diabetes from the same center (manuscript under preparation).

A limiting factor in this study has been the lack of objective data regarding sunlight exposure, calcium intake and vitamin D intake. The study was conducted during summer months, and results may have been different in winter, because of lesser sunlight exposure. However, these limitations do not detract from the major issue, which is the frequent occurrence of vitamin D deficiency. But a study conducted in winter might have revealed a higher prevalence of vitamin D deficiency in state.

CONCLUSION

The study has, for the first time, revealed a high prevalence of low vitamin D levels (66.67 %) in healthy, asymptomatic postmenopausal women in Haryana.

These results are similar to the high rates of vitamin D deficiency observed in neighbouring states. The findings have enormous public health and clinical implications for the state as well as physicians. Political and community leaders should be sensitized to the need for public health measure to improve vitamin D health. Physicians should be aware of the high prevalence of subclinical vitamin D deficiency in "healthy" post menopausal women, and take appropriate steps to correct it.

REFERENCES

- [1] Wilson DC. The incidence of osteomalacia and late rickets in northern India. *The Lancet* 1931; 218(5627): 10-2.
- [2] Vaishnav HP, Rizvi SNA. Osteomalacia in northern India. *Br Med J.* 1967;1:112
- [3] Teotia SPS, Teotia M. Nutritional bone disease in Indian population. *Indian J Med Res* 2008; 127:219-28
- [4] Marya RK, Saini AS, Rathee S, Arora SR. Osteomalacia in Hindu population of Haryana. *Indian J Med Res* 1981; 73:756-60.
- [5] Marya RK, Bhargava JS. Prevalence of hypocalcaemia and hypophosphataemia in the elderly males in Haryana. *Indian J Physiol Pharmacol* 1984; 28(2):145-8.
- [6] Singh J, Marya RK, Sharma A. Screening of rickets in a Haryana town. *Ind Pediatr* 1992; 29:226-8.
- [7] Agarwal KS, Mughal MZ, Upadhyay P, Berry JL, Marwer EB, Puliye JM. The impact of atmospheric pollution on vitamin D states of infants and toddlers in Delhi, India, *Arch Dis Child* 2002;87:11-3.
- [8] Singh AP, Fakhruddin, Tanwar RK, Gahlot AK. Osteomalacia in cattle. *Veterinary Practitioner* 200;1: 45-46
- [9] Harinarayan CV, Joshi SR. Vitamin D status in India- its implication and remedial measures. *JAPI* 2009; 57: 40-48.
- [10] Goswami R, Gupta N, Kochupillai N. Prevalence and significance of low 25-hydroxyvitamin D concentrations in healthy subjects in Delhi. *Am J Clin Nutr* 2000;72:472-5.
- [11] Arya V, Bhambri R, Godbole MM, Mithal A. Vitamin D status and its relationship with bone mineral density in healthy Asian Indians. *Osteoporos Int* 2004; 15: 56-61.
- [12] Harinarayan CV, Ramalakshmi T, Venkataprasad U. High prevalence of low dietary calcium and low vitamin D status in healthy south Indians Asia Pac *J Clin Nutr* 2004;13:359-64.
- [13] Harinarayan CV. Prevalence of vitamin D insufficiency in postmenopausal south Indian women. *Osteoporosis Int* 2005 Apr; 16 (4): 397-402. Epub 2004 Jul 30
- [14] Paul TV, Thomas N, Seshadri MS, Oommen R, Jose A, Mahendri NV. Prevalence of osteoporosis in ambulatory postmenopausal women from a semiurban region in Southern India: a relationship to calcium nutrition and vitamin D status. *Endocr Pract* 2008;14:565-71
- [15] Alekel DL, Mortillaro E, Hussain EA, West B, Ahmed N, Peterson CT. et al. Lifestyle and biologic contributors to proximal femur bone mineral density and hip axis length in two distinct ethnic groups of premenopausal women. *Osteoporos Int* 1999; 9: 327-38
- [16] Awumey EM, Mitra DA, Hollis BW, Kumar R, Bell NH. Vitamin D metabolism is altered in Asian Indians in the southern United States: a clinical

research center study. J Clin Endocrinol Metab 1998; 83: 169-73.

- [17] Holick MF. Vitamin D deficiency. New England journal of Medicine, 2007; 357(3): 266-81.
- [18] Rejnmark L, Vestergaard P, Heickendorff L, Mosekilde L Plasma 1, 25(OH) 2 D levels decrease in postmenopausal women with hypovitaminosis D.

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CONFLICT OF INTEREST

No conflict of interest was declared by authors.

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