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Assessment of vitamin D status in children of Churu Region: An Observation Study

Author
Ikram Hussain
Junior specialist (MD, Paediatrics), D.B. Hospital, Churu, Rajasthan

Abstract
Background: *Vitamin D is important for calcium and phosphorus metabolism. There are not many natural food items that contain vitamin D, therefore the amount of time in sunlight is the important source of vitamin D. Hence; we planned the present study to assess the vitamin D status in children of Churu region.*
Materials & Methods: *The present study included assessment of vitamin D status of children of Churu region. A total of 200 paediatric subjects were included in the present study. Complete demographic and clinical details of all the subjects were obtained from their parents or guardians. Capillary blood was collected by a certified nurse after pricking the fingertip with a single-use safety lancet. Vitamin D status was classified as severely deficient, moderately deficient, mildly deficient and sufficient. All the results were recorded and analyzed by SPSS software.*
Results: *Mean serum 25 (OH)D levels among subjects less than 24 months and more than 36 months was 38.4 and 29.1 (nmol/l) respectively. Significant difference was obtained while comparing the mean serum 25(OH)D levels in subjects divided on the basis of age group. Majority of the subjects had mildly deficient status of vitamin D.*
Conclusion: *Mild form of vitamin deficiency does exist in children of Churu region. Therefore adequate measures and screening programmes should be carried out for controlling it.*
Keywords: *Children, Status, Vitamin D.*

Introduction

For the health and specifically for the growth of the bones, Vitamin D is an essential vitamin. It is also important for calcium and phosphorus metabolism.[1] There are not many natural food items that contain vitamin D, therefore the amount of time in sunlight is the important source of vitamin D. Vitamin D deficiency can result in skeletal diseases, such as rickets and osteomalacia. In addition, vitamin D receptors exist in the endocrine glands and cardiovascular tissues, and take part in the differentiation of cell, and the production of various cytokines and interleukins, which, taken together, means that they are relevant in metabolic syndromes, diabetes, autoimmune diseases, and cardiovascular diseases.[2- 4] Moreover, respiratory infections, food allergies, and asthma are known to increase with vitamin D deficiency, and there are also reports that menarche starts earlier in vitamin D deficient girls. The known risk factors associated with vitamin D deficiency are skin pigmentation, older age, lesser sunlight exposure, lower intake of vitamin D rich food or supplements, and higher

body mass index (BMI).[3-7] Hence; we planned the present study to assess the vitamin D status in children of Churu region.

Materials & methods

The present study was planned in the department of paediatric medicine of the D.B. Hospital, Churu, Rajasthan and included assessment of vitamin D status of children of churu region. Ethical approval was taken from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 200 paediatric subjects were included in the present study. Inclusion criteria for the present study included:

- Subjects with negative history of systemic illness,
- Subjects with negative history of any form of metabolic disorder,
- Subjects with negative history of any bone related pathology,
- Subjects with any known drug allergy

Subjects reporting to the paediatric OPD for routine check-up were included in the present study. Written consent was obtained from their parents/guardians, and only then they were enrolled in the present study. Complete demographic and clinical details of all the subjects were obtained from their parents or guardians. Capillary blood was collected by a certified nurse after pricking the fingertip with a single-use safety lancet. Four to five drops were collected from the subjects. Diazyme's 25-OH Vitamin D Assay was used for assessment of means serum Vitamin D and was expressed in terms of 25(OH)D levels. There is no common universal normal range for s-25(OH)D; however, we chose to use the commonly used cut-off points, where vitamin D status is classified as severely deficient (0–12·5 nmol/l), moderately deficient (12·6–25·0 nmol/l), mildly deficient (25·1–49·9 nmol/l) and sufficient (≥50·0 nmol/l)[8]. All the results were recorded and analyzed by SPSS software. Chi- square test and student t test were used for assessment of level of significance. P- Value of less than 0.05 was taken as significant.

Results

A total of 200 children were included in the present study. Out of 200, 60 and 70 subjects were less than 24 months of age and more than 36 months of age respectively. Mean serum 25 (OH)D levels among subjects less than 24 months and more than 36 months was 38.4 and 29.1 (nmol/l) respectively. Significant difference was obtained while comparing the mean serum 25(OH)D levels in subjects divided on the basis of age group. However; we didn't observe any significant difference while comparing the mean 25(OH)D levels in subjects divided on the basis of gender of parent's annual income. Majority of the subjects had mildly deficient status of vitamin D as shown in Table 2.

Table 1: Comparison of demographic details of the subjects

Parameter		No. of subjects	Mean Serum 25(OH)D (nmol/l)	P- value
Age group (months)	< 24	60	38.4	0.00*
	24- 36	70	31.5	
	> 36	70	29.1	
Gender	Males	120	32.5	0.11
	Females	80	31.4	
Parent's annual income (Rupees)	< 2 Lakh	92	33.2	0.65
	2 Lakh- 4 lakh	68	32.1	
	> 4lakh	40	31.8	

*: Significant

Graph 1: Demographic details of the subjects

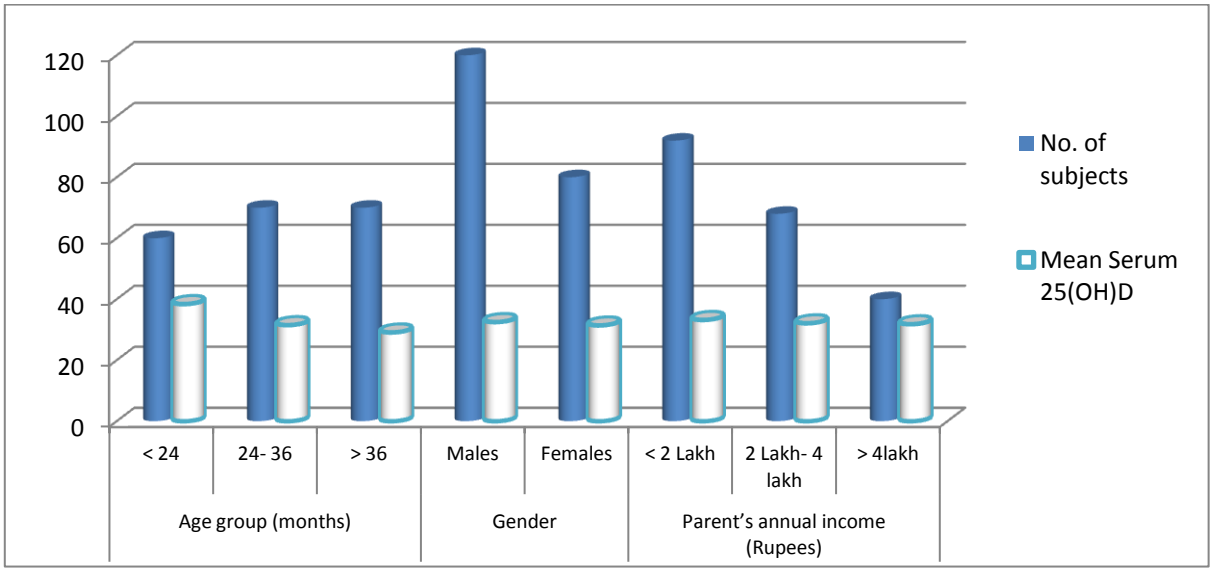

Table 2: Vitamin D status of the subjects on the basis of mean serum 24(OH)D levels

Parameter	serum 24(OH)D range (nmo/L)	Number of subjects	Percentage prevalence
Average	≥50	20	10
Mild deficient	25.1- 49.9	121	60.5
Moderately deficient	12.6- 25	48	24
Severely deficient	< 12.6	11	5.5
Total		200	100

Discussion

Vitamin D deficiency may develop from nutritional deficiencies, malabsorption, enzyme-inducing medications, and many other etiologies.[8] It may present as hypocalcemia before bone demineralization at periods of increased growth velocity (infancy and adolescence) because the increased calcium demand of the body cannot be met. In children, inadequate concentrations of vitamin D may cause rickets and/or symptomatic hypocalcemia, such as seizures or tetany.[9- 11] Hence; we planned the present study to assess the vitamin D status in children of Churu region.

In the present study, we observed that subjects of less than 24 months of age had significantly lower levels of serum 24(OH)D in comparison to other subjects. Also mild deficiency of vitamin D was more common in children. Avagyan D et al determined vitamin D status and its determinants in Nepalese children of pre-school age. Healthy children (n 280) aged 12-60 months, selected randomly from the records of a vitamin A supplementation programme. Blood samples were collected using the dried blood spot technique and analysed for serum 25-hydroxyvitamin D (s-25 (OH)D) concentration using liquid chromatography-tandem mass spectrometry. Ca intake and background variables were assessed with a structured questionnaire. Hypovitaminosis D, defined as s-25(OH)D concentration less than 50 nmol/l, was found in 91.1% of the children. S-25(OH)D concentration was not related to gender, socio-economic indicators, sun exposure or nutritional status. Currently breast-fed children had higher s-25(OH)D concentrations (36.4 (sd 13.2) nmol/l) than those who were not (28.6 (sd 9.8) nmol/l, P<0.001). Adjustment for sociodemographic factors did not alter the results. There is widespread vitamin D deficiency among pre-school children in a rural area of Nepal. In their sample, sociodemographic factors did not affect the vitamin D status of children, but prolonged breast-feeding was associated with higher s-25(OH)D concentrations.[12]

Haugen J et al described the status and predictors of vitamin D status in healthy Nepalese mothers

and infants.500 randomly selected Nepalese mother and infant pairs were included in a cross-sectional study. Plasma 25(OH)D concentrations were measured by LC-MS/MS and multiple linear regression analyses were used to identify predictors of vitamin D status. Among the infants, the prevalence of vitamin D insufficiency (25(OH)D <50 nmol/L) and deficiency (<30 nmol/L) were 3.6% and 0.6%, respectively, in contrast to 59.8% and 14.0% among their mothers. Infant 25(OH)D concentrations were negatively associated with infant age and positively associated with maternal vitamin D status and body mass index (BMI), explaining 22% of the variability in 25(OH)D concentration. Global solar radiation, maternal age and BMI predicted maternal 25(OH) D concentration, explaining 9.7% of its variability. Age and maternal vitamin D status are the main predictors of vitamin D status in infants in Bhaktapur, Nepal, who have adequate vitamin D status despite poor vitamin D status in their mothers.[13] Voortman T et al measured serum 25-hydroxyvitamin D [25(OH)D] concentrations in 4167 children aged 6 y and defined deficiency following recommended cutoffs. They examined the associations between subject characteristics and vitamin D deficiency with the use of multivariable logistic regression analyses. Serum 25(OH)D concentrations ranged from 4 to 211 nmol/L (median: 64 nmol/L), with 6.2% of the children having severely deficient (<25 nmol/L), 23.6% deficient (25 to <50 nmol/L), 36.5% sufficient (50 to <75 nmol/L), and 33.7% optimal (≥75 nmol/L) 25(OH)D concentrations. The prevalence of vitamin D deficiency [25(OH)D <50 nmol/L] was higher in winter (51.3%) than in summer (10.3%); and higher in African, Asian, Turkish, and Moroccan children (54.5%) than in those with a Dutch or other Western ethnic background (17.6%). In multivariable models, several factors were associated with vitamin D deficiency, including household income (OR: 1.74; 95% CI: 1.34, 2.27 for low vs. high income), child age (OR: 1.39; 95% CI: 1.20, 1.62 per year), child television watching (OR: 1.32; 95% CI: 1.06, 1.64 for ≥2 vs. <2 h/d), and playing outside (OR: 0.71; 95% CI: 0.57, 0.89 for ≥1 vs. <1 h/d). In a subgroup with dietary data (n = 1915), vitamin D deficiency was associated with a lower diet quality, but not with vitamin D intake or supplement use in early childhood. Suboptimal vitamin D status is common among 6-y-old children in The Netherlands, especially among non-Western children and in winter and spring.[14]

Conclusion

From the above results, the authors concluded that mild form of vitamin deficiency does exist in children of Churu region. Therefore adequate measures and screening programmes should be carried out for controlling it.

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