International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article.

Evaluation of Vitamin D Status among Known Paediatric Population at a Tertiary Care Hospital: A Clinical Study

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ABSTRACT

Background: Deficiency of vitamin D causes osteomalacia, leading to growth retardation and skeletal deformities in children and osteoporosis in adults. There is growing recognition of the role vitamin D plays in health impacting the innate immune system to prevent infections and the adaptive immune system to modulate autoimmunity. Hence; we planned the present study to assess the vitamin D status in a known paediatric population.

Materials & Methods: We planned the present study to assess status of vitamin D among known paediatric population. A total of 150 paediatric subjects were included in the present study. We recorded complete demographic and clinical details of all the subjects. A certified paediatrician was employed for collecting the capillary blood from all the subjects after pricking them on their fingertip. From all the subjects, approximately four to five drops of blood was collected, stored and was sent to laboratory for assessment of means serum Vitamin D and was expressed in terms of 25(OH)D levels. All the results were compiled and were evaluated by SPSS software.

Results: Among 150 subjects, 100 were males while the remaining were females. Mild deficiency of vitamin D was found to be present in percent of the subjects. Moderate and sever deficiency of Vitamin D was found to be present in 20 and 16.7 percent of the subjects respectively.

Conclusion: Vitamin D deficiency is prevalent in significant proportion of paediatric population.

Key words: Paediatric, Status, Vitamin D.

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Article History:

Received: 22-04-2019, **Revised:** 15-05-2019, **Accepted:** 29-05-2019

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2019.5.3.069	

INTRODUCTION

Vitamin D, the sunshine vitamin, has long been recognized as essential for bone and mineral metabolism. Deficiency of vitamin D causes osteomalacia, leading to growth retardation and skeletal deformities in children and osteoporosis in adults.

Sun exposure is the main source of vitamin D in humans, as only a small amount is obtained from the diet. In the liver, vitamin D3 is converted to 25-hydroxyvitamin D (25[OH]D), the major circulating form and best indicator of vitamin D status. Although there is no consensus on optimal levels of 25-hydroxyvitamin D as measured in serum, vitamin D deficiency is defined by most experts as a 25-hydroxyvitamin D level of less than 50 nmol per liter.[4] Knowledge of vitamin D in the health of children has grown greatly over the years, extending past the importance for calcium homeostasis and bone growth. There is growing recognition of the role vitamin D plays in health impacting the innate immune system to prevent infections and the adaptive immune system to modulate autoimmunity.[5-7] Hence; we planned the present study to assess the vitamin D status in a known paediatric population.

MATERIALS & METHODS

We planned the present study in the Department of Paediatrics, Saraswati Institute of Medical Sciences, Anwarpur, Hapur, UP (India) and it involved evaluation of status of vitamin D among known paediatric population. A total of 150 paediatric subjects were included in the present study.

Exclusion Criteria

- Children with presence of any metabolic bone pathology,
- Children with presence of diabetes,
- Children with presence of hypertension

After meeting the exclusion criteria, a total of 150 paediatric subjects were included in the present study. These all these subjects reported to the department of paediatric medicine with their parents/guardians for routine medical check-up. We obtained written consent from the guardians of all the patients becoming enrolling them into the study. We recorded complete demographic and clinical details of all the subjects. A certified paediatrician was

employed for collecting the capillary blood from all the subjects after pricking them on their fingertip. From all the subjects, approximately four to five drops of blood was collected, stored and was sent to laboratory where 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. Cut-off points used in the present study for dividing the subjects was as follows:

- Severely Deficient: 0-12.5 nmol/L
- Moderately Deficient: 12.6- 25 nmol/L
- Mildly Deficient: 25.1- 49.9 nmol/L
- Sufficient: more than or equal to 50 nmol/L[8]

All the results were compiled and were evaluated by SPSS software. Multivariate regression curve was used for assessment of level of significance.

RESULTS

A total of 150 paediatric subjects were included in the present study. Majority of the subjects were less than 30 months of age. Among 150 subjects, 100 were males while the remaining were females.

We didn't observe any significant difference in the mean vitamin D values in between males and females. In majority of the subjects, the parent's annual income was less than one lakh rupees. We also didn't observe any significant difference while comparing the vitamin D status of the subjects when divided on the basis of parent's annual income. Mild deficiency of vitamin D was found to be present in percent of the subjects. Moderate and sever deficiency of Vitamin D was found to be present in 20 and 16.7 percent of the subjects respectively.

Table 1: Demographic details of the subjects

Parameter		No. of subjects	Mean Serum 25(OH)D (nmol/l)	P- value
Age group (months)	**< 20**	50	33.5	0.47
	20- 30	60	32.1	
	> 30	40	30.8	
Gender	**Males**	100	33.4	0.84
	Females	50	32.0	

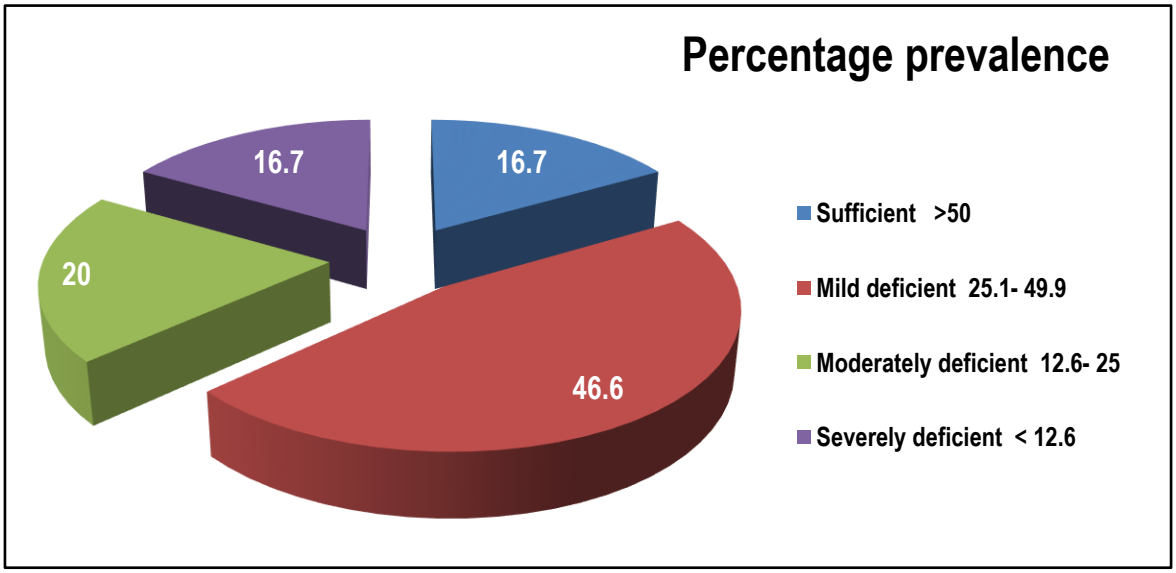
Table 2: Financial Details of the subjects

Parameter		No. of subjects	Mean Serum 25(OH)D (nmol/l)	P- value
Parent's annual	**< 1 Lakh**	80	30.7	0.81
income (Rupees)	**1 Lakh- 2 lakh**	30	30.9	
	2 lakh- 4 lakh	25	32.5	
	> 4lakh	15	33.7	

Table 3: Vitamin D status of the subjects

Parameter	Serum 4(OH)D range (nmo/L)	Number of subjects	Percentage prevalence
Sufficient	≥50	25	16.7
Mild deficient	25.1- 49.9	70	46.6
Moderately deficient	12.6- 25	30	20
Severely deficient	< 12.6	25	16.7
Total		150	100

Graph 1: Percentage prevalence of vitamin D deficiency among paediatric subjects



DISCUSSION

Vitamin D is an essential component of bone and mineral metabolism; its deficiency causes growth retardation and skeletal deformities in children and osteomalacia and osteoporosis in adults. Hypovitaminosis D (vitamin D insufficiency or deficiency) is observed not only in adults but also in infants, children, and adolescents.[9-11] Hence; we planned the present study to assess the vitamin D status in a known paediatric population.

In the present study, we observed that moderate and sever deficiency of Vitamin D was found to be present in 20 and 16.7 percent of the subjects respectively. Zhu Z et al surveyed the serum levels of 25-hydroxyvitamin D [25(OH)D] in more than 6,000 children aged 1 month to 16 years in Hangzhou (latitude: 30°N), the capital of Zhejiang Province, southeast China. The children aged 1 month to 16 years who came to the child health care department of our hospital, the children's hospital affiliated to Zhejiang university school of medicine, for health examination were taken blood for 25(OH) D measurement. Serum 25(OH) D levels were determined by direct enzyme-linked immunosorbent assay and categorized as < 25, < 50, and < 75 nmol/L. A total of 6,008 children aged 1 month to 16 years participated in this cross-sectional study. All the subjects were divided into subgroups according to their age: 0-1y, 2-5y, 6-11y and 12-16y representing infancy, preschool, school age and adolescence stages respectively. The highest mean level of serum 25(OH)D was found in the 0-1y stage (99 nmol/L) and the lowest one was found in 12-16y stage (52 nmol/L). Accordingly, the prevalence of serum 25(OH)D levels of < 75 nmol/L and < 50 nmol/L were at the lowest among infants (33.6% and 5.4% respectively) and rose to the highest among adolescents (89.6% and 46.4% respectively). The mean levels of serum 25(OH)D and the prevalence of vitamin D deficiency changed according to seasons. In winter and spring, more than 50% of school age children and adolescents had a 25(OH)D level at < 50 nmol/L. If the threshold is changed to < 75 nmol/L, all of the adolescents (100%) had low 25(OH)D levels in winter and 93.7% school age children as well. The prevalence of vitamin D deficiency and insufficiency among children in Hangzhou Zhejiang province is high, especially among children aged 6-16 years.[12]

Flores M et al assessed the vitamin D status in preschool and school-age children in Mexico. 25-hydroxyvitamin D (25-OH-D) serum concentrations were measured using a direct enzyme-linked immunosorbent assay commercial kit in a nationally representative sample of 1025 Mexican children ages 2 y to 12 y who participated in the 2006 Mexican National Health and Nutrition Survey. Mean serum 25-OH-D concentration was 94.6 ± 47 nmol/L. Concentrations were lower in preschool children (2-5 y; 78.3 ± 37 nmol/L) than in school-aged children (6-12 y; 105.8 ± 51 nmol/L; P < 0.001). Children living in urban areas had lower levels (89.8 ± 36 nmol/L) than children from rural areas (108.1 ± 75 nmol/L; P < 0.05). Twenty-four percent of preschool children had vitamin D deficiency (25-OH-D < 50 nmol/L) compared with 10% of school-aged children (P < 0.05). Thirty percent of preschool children had vitamin D insufficiency (25-OH-D 50-74.9 nmol/L) compared with 18% of school-aged children (P < 0.05). In urban areas, 18% of children had vitamin D deficiency and 25% had insufficiency compared with 10% and 16% of children in rural areas, respectively (P < 0.05). Prevalence of severe vitamin D deficiency (25-OH-D < 20 nmol/L) was extremely low (0.3%). Vitamin D deficiency and insufficiency are important public health problems in Mexican children.[13]

Voortman T et al described vitamin D status in the Generation R study, a large multiethnic cohort of 6-y-old children in The Netherlands, and to examine sociodemographic, lifestyle, and dietary determinants of vitamin D deficiency. They measured serum 25-hydroxyvitamin D [25(OH)D] concentrations in 4167 children aged 6 y and defined deficiency following recommended cutoffs. We 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

Under the light of above mentioned results, the authors conclude that vitamin D deficiency is prevalent in significant proportion of paediatric population. Hence; necessary measures should be taken for increasing the awareness in relation to Vitamin D and its deficiency signs and symptoms among general population.

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Source of Support: Nil.

Conflict of Interest: None Declared.

Cite this article as: Devendra Kumar, Vishal Garg. Evaluation of Vitamin D Status among Known Paediatric Population at a Tertiary Care Hospital: A Clinical Study. Int J Med Res Prof. 2019 May; 5(3):300-03. DOI:10.21276/ijmrp.2019.5.3.069