International Journal of Scientific Reports
Chaudhari RK et al. Int J Sci Rep. 2021 May;7(5):257-260
http://www.sci-rep.com
pISSN 2454-2156 | eISSN 2454-2164
DOI: https://dx.doi.org/10.18203/issn.2454-2156.IntJSciRep20211452

Original Research Article

Vitamin D deficiency among the patients attending B. P. Koirala Institute of Health Sciences: a cross sectional study

Rajendra K. Chaudhari*, Cosmica Shah, Ananya Raman, Dikshya Yadav, Basanta Gelal

Department of Biochemistry, B. P. Koirala Institute of Health Sciences, Dharan, Nepal

Received: 02 March 2021
Accepted: 03 April 2021

***Correspondence:**
Dr. Rajendra K. Chaudhari,
E-mail: rajendra.chaudhari@bpkihs.edu

ABSTRACT

Background: Vitamin D deficiency has become a public health problem worldwide regardless to geography. Vitamin D deficiency leads to osteoporosis and also associated with metabolic syndrome, cardiovascular diseases, obesity, diabetes and autoimmune disorders. Early detection of vitamin D level in blood followed by supplementation can prevent various chronic diseases. There are limited studies of vitamin D deficiency from eastern Nepal therefore we planned to assess the prevalence of vitamin D in different age groups and gender among patients visiting at BPKIHS.
Methods: This descriptive cross-sectional study was done among the patients attending Immunoassay laboratory of the BPKIHS. Based on purposive sampling technique, data of first visit of patients were taken who came for investigation of vitamin D from January to March, 2019. Serum 25 (OH) vitamin D levels were measured by CLIA method using Maglumi 2000 (Snibe Co. Ltd, Shenzhen, China).
Results: A total of 2399 (73.81%) female and 851 (26.19%) males were enrolled in the study among which 66 (2.03%), 133 (4.09%) and 3051 (93.88%) were children, adolescent and adult respectively. This study revealed 61.2%, 27.6% and 11.2% patients having deficient, insufficient and sufficient level of serum vitamin D respectively. Significantly, highest percentages of adolescents were found vitamin D deficient compared to adults and children. Adolescents have shown significantly low median levels of vitamin D ($p<0.001$).
Conclusions: Prevalence of vitamin D deficiency is higher in patients visiting BPKIHS. Comparatively higher percentage of vitamin D deficiency and low vitamin D levels are reported among adolescents compared to children and adult.

Keywords: Prevalence, Vitamin D, Vitamin D deficiency

INTRODUCTION

Vitamin D plays an important role in calcium and phosphorous homeostasis. Vitamin D deficiency leads to osteoporosis of bone and its deficiency is associated with metabolic syndrome, cardiovascular diseases, obesity, diabetes and autoimmune disorders. Regmi et al have reported 74.1% vitamin D deficiency in a hospital-based study from Nepal.[1] Around 90% of apparently healthy Indians have subnormal vitamin D levels.[2]

Vitamin D deficiency is reported in many populations across the world regardless of age and gender.[3] High prevalence of vitamin D deficiency is due to inadequate sun exposure, dietary supplement and use of sun protecting creams. Early detection of vitamin D deficiency followed by supplementation can prevent associated comorbidities. There are limited studies of vitamin D deficiency from eastern Nepal. The objective of the study was to find out the prevalence of vitamin D deficiency in different age groups and gender among patients requesting for vitamin D measurement.

METHODS

Current study was a descriptive cross-sectional hospital-based study done from January to March, 2019 in department of Biochemistry, B. P. Koirala institute of

health sciences (BPKIHS). Sample size was calculated based on the prevalence of vitamin D deficiency from the study of Regmi et al in which the prevalence was 74.1%, considering 5% allowable error and at 95% confidence interval. The sample size was calculated equivalent to 295.[1] However, a total of 3250 patients of age ranges one to ninety eight years old were enrolled based on purposive sampling method. Data of first visit of patients were included who came for investigation of vitamin and not on vitamin D supplementation for last six months. Patients with known chronic kidney disease, liver impairment were excluded from study. Serum 25 (OH) vitamin D was measured by chemiluminescence immunoassay (CLIA) method using Maglumi 2000 (Snibe Co. Ltd, Shenzhen, PR. China) with standard laboratory practice.

Vitamin D status was categorized as deficiency: <20 ng/ml, insufficient: 21-29 ng/ml, sufficient: 30-100 ng/ml and excess: >100 ng/ml. Data were entered in worksheet of Microsoft Excel 2007 and converted into SPSS version 11.5 for statistical analysis. Data were expressed in frequency, percentage, mean (standard deviation) and median (IQR) for the descriptive analysis. Chi square, Mann-Whitney test and Kruskal Wallis test were applied based on the nature of data, $p \leq 0.05$ was considered as statistically significant at 95% confidence interval.

RESULTS

A total of 3250 patients with age group ranging from one year to 98 years have been enrolled in the study. This study revealed, 61.2%, 27.6% and 11.2% patients having deficient, insufficient and sufficient level of serum vitamin D respectively. Only 10 patients had excess serum vitamin D (Figure 1). A total of 2399 (73.81%) female and 851 (26.19%) males were enrolled in the study among which 66 (2.03%), 133 (4.09%) and 3051 (93.88%) were children, adolescent and adult respectively. Relatively higher percentages of female were found vitamin D deficient but statistically not significant (Table 1).

Table 1: Serum vitamin D status according to sex and age group.

Parameters	Subgroups	Vitamin D status				P value
		Deficient frequency (%)	Insufficient frequency (%)	Sufficient frequency (%)	Excess frequency (%)	
Sex	Female (N=2399)	1490 (62.10)	639 (26.60)	264 (11.0)	6 (0.30)	0.127
	Male (N=851)	498 (58.50)	259 (30.40)	90 (10.60)	4 (0.50)	
Age group	Children (N=66)	31 (47.0)	28 (42.40)	6 (9.10)	1 (1.50)	<0.001
	Adolescent (N=133)	97 (72.90)	26 (19.50)	10 (7.50)	0 (0.0)	
	Adult (N=3051)	1860 (61.0)	844 (27.70)	338 (11.10)	9 (0.30)	

*Fisher's exact test was applied considering $p \leq 0.05$ as statistically significant.

Table 2: Serum vitamin D level different sub-groups.

Parameters	Serum Vitamin D (ng/ml)		P value
Sex	Female (N=2399)	17.43 (13.61-23.57)	0.74*
	Male (N=851)	18.39 (13.8-23.9)	
Age group	Children (N=66)	21.51 (15.87-26.83)	<0.001**
	Adolescent (N=133)	16.06 (13.14-20.48)	
	Adult (N=3051)	17.71 (13.66-23.70)	

*Mann-Whitney test, **Kruskal-Wallis test were applied considering $p \leq 0.05$ as statistically significant.

Similarly, vitamin D levels were relatively low in female but not significantly different from male (Table 2). Significantly highest percentages of adolescents were found vitamin D deficient compared to adults and children (Table 1). Median (IQR) of serum vitamin D level in children, adolescent and adult were found 21.51 (15.87, 26.83) ng/ml, 16.06 (13.14, 20.48) ng/ml and 17.71 (13.66, 23.70) ng/ml respectively which showed that adolescents have significantly lowest median level of vitamin D compared to adults and children (Figure 2, Table 2).

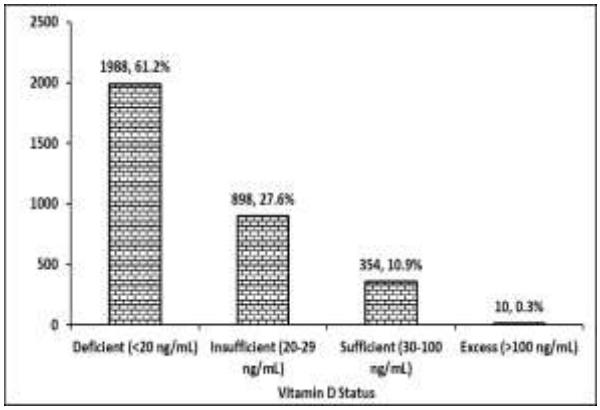

Figure 1: Vitamin D Status of the patients.

DISCUSSION

The result of this study revealed 61.2% and 27.6% deficiency and insufficiency of vitamin D respectively among the total patients visited for investigation of serum vitamin D levels. We have not found any significant statistical difference in prevalence of vitamin D

deficiency and median vitamin D levels between male and female patients. However, higher numbers of female patients were visited our laboratory for investigation of serum vitamin D level.

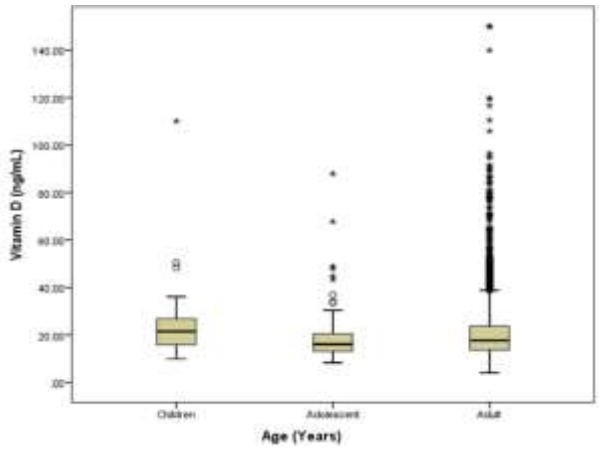

Figure 2: Serum vitamin D level in study population.

In the present study, adolescents were reported significantly highest percentage of vitamin D deficiency and having low serum vitamin D levels compared to adults and children. A hospital based cross-sectional study in Chitwan, Nepal by Regmi et al have reported 74.1% patents with vitamin D deficiency (less than 30 ng/ml) out of which 27.8%, 28.7% and 17.6% patients have severe deficiency (<10 ng/ml), deficiency (10-19 ng/ml) and insufficiency (20-29 ng/ml) respectively. The prevalence was found higher in females (95.2%), though the difference in prevalence between sexes (p=0.243) and vitamin D status with respect to different age groups was not statistically significant (p=0.187).[1] Avagyan et al found that 91.1% of vitamin D deficiency among rural preschool children in a community based cross-sectional study in Kavrepalanchowk district of Nepal at latitude 27·39°N.[4] A hospital based cross sectional study conducted by Rai et al at Kathmandu medical college reveals 73.6% vitamin D deficiency among study population with significantly high deficiency in female.[5] A relatively low prevalence i.e. 22.6% vitamin D deficiency was reported by Sharma et al in a community based study around Guwahati, Assam, India.[6] A community based study from Bangladesh by Shafi et al evidences 60.6% vitamin D deficiency in rural respondents.[7] Bhatta et al had found 73.68% patients with vitamin D deficiency (below 30 ng/dl) in working adult population of western region of Nepal and female were more deficient than male (p=0.016).[8] A study conducted in North India on children with mean age of 3.31 years by Angurana et al were found 40.24%, 25.44%, and 34.32% percentages of children with deficient, insufficient, and sufficient levels of vitamin D respectively in children belonging in upper socioeconomic status. On univariate analysis, levels of vitamin D deficiency were associated with relatively younger age group, female sex, failure to thrive, exclusive breast feeding, inadequate sun exposure, and no vitamin D supplements.[9]

A hospital-based study in Kathmandu have showed 69.6% patients with vitamin D deficiency (<20 ng/dl) and 16.2% patients having insufficient levels of vitamin D (20-30 ng/dl). The mean serum vitamin D concentration were 22.38±17.07 ng/ml and 18.89±15.25 ng/ml in male and female respectively.[10] A hospital-based study by CP Pal et al. in Utter Pradesh, India have reported 1034 (91.3%) patient having vitamin D deficiency (<30ng/dl); among them 693 (61.2%) patients had severe vitamin D deficiency (<20ng/dl) and only 98 (8.7%) patients had sufficient vitamin D level. Vitamin D levels was found comparable in male and female (p=0.75) but lower in patients with less mean sun exposure time.[11]

A study conducted in Abu Dhabi found that the majority (72%) of the study population were vitamin D deficient (<50 nmol/l) and 10% were vitamin D insufficient (50-74 nmol/l). Prevalence of vitamin D deficiency was comparable in both sexes. Low vitamin D level was associated with high blood pressure, high body mass index, central obesity, high cholesterol, impaired blood glucose levels and a high Framingham risk score. The mean vitamin D level was highest in January (winter) and lowest in July (summer). The proportion of the study populations having less than 30 years of age were more vitamin D deficient than those older than 30 years.[12] This finding is coherent with our report as younger age groups are having low vitamin D levels.

CONCLUSION

Prevalence of vitamin D deficiency is higher in patients visiting BPKIHS. Comparatively higher percentage of vitamin D deficiency and low vitamin D levels are reported among adolescents compared to children and adult.

ACKNOWLEDGEMENTS

Authors would like to thank department of biochemistry, B. P. Koirala Institute of health sciences, Dharan, Nepal for providing platform to conduct this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Regmi S, Regmi AP, Adhikari S, Shakya D. Prevalence of vitamin D deficiency/insufficiency among children, adolescents. J Chitwan Med Coll. 2017;7(19):11-5.
2. Holick MF. Vitamin D deficiency. N Engl J Med. 2007;357:266-81.
3. Ritu G, Gupta A. Vitamin D deficiency in India: prevalence, causalities and interventions. Nutrients. 2014; 6:729-75.

4. Avagyan D, Neupane SP, Gundersen TE, Madar AA. Vitamin D status in pre-school children in rural Nepal. Public Health Nutr. 2015;19(3):470-6.
5. Rai CK, Shrestha B, Sapkota J, Das JK. Prevalence of Vitamin D deficiency among adult patients in a tertiary care hospital. J Nepal Med Assoc. 2019; 57(218):226-8.
6. Sarma D, Saikia UK, Baro A. Vitamin D status of school children in and around Guwahati. Indian J Endocrinol Metabol. 2019;23(1):81-5.
7. Shafi A, Chowdhury SK, Hossain IA , Yasmin R, Haque MM, Faruquee MH, et al. Status of serum vitamin D among Bangladeshi children: urban and rural settings. Acta Sci Paediatr. 2019;2(8):3-7.
8. Bhatta MP, Pandey BR, Gurung KM, Nakarmi R, Gurung K, Gurung LB, et al. Prevalence of vitamin D deficiency among adult population of Western Region of Nepal. Int J Med Biomed Sci. 2016;1(2): 7-12
9. Angurana SK, Angurana RS, Mahajan G, Kumar N, Mahajan V. Prevalence of vitamin D deficiency in apparently healthy children in north India. J Pediatr Endocrinol Metab. 2014;27(11-12):1151-6.
10. Poudel N, Dhakal SS, Sukhupayo R, Karki DB. Vitamin D deficiency among patients visiting a tertiary care hospital: a descriptive cross-sectional study. J Nepal Med Assoc. 2020;58(231):839-42.
11. Pal CP, Kumar H, Kumar D, Mittal V, Deshwar G, Altaf D, et al. Prevalence of vitamin D deficiency in orthopedic patients: A single centre study. J Clin Orthopaed. 2016;7(2):S2143-6.
12. Al Zarooni ABR, Al Marzouqi FI, Al Darmaki SH, Margrietha PEA, Nagelkerke N. Prevalence of vitamin D deficiency and associated comorbidities among Abu Dhabi Emirates population. BMC Res Notes. 2019;12:503-6.

Cite this article as: Chaudhari RK, Shah C, Raman A, Yadav D, Gelal B. Vitamin D deficiency among the patients attending B. P. Koirala Institute of Health Sciences: a cross sectional study. Int J Sci Rep 2021;7(5):257-60.