Original Research Paper

Volume - 11 | Issue - 03 | March - 2021 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Pediatrics

PREVALENCE OF VITAMIN D DEFICIENCY AMONG SCHOOL GOING CHILDREN: AN EXPERIENCE FROM A TERTIARY HEALTH CARE FACILITY OF EASTERN INDIA

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ABSTRACT Screening of vitamin D deficiency is specially recommended in pediatric age group who is more prone for its deficiency and consequent impaired bone mineralization. An Institution based, Observational, Cross-Sectional study with an objective to find out the prevalence of vitamin D deficiency among children attending pediatric OPD of a tertiary health care facility of Eastern India. A total of 98 study subjects were selected through systematic random sampling. Serum 25 (OH) D was classified as deficient, insufficient, sufficient, therapeutic, and potential toxicity if the serum concentration was <20ng/ml, 20-29ng/ml, 30-60ng/ml, 61-100ng/ml and >100ng/ml respectively. Data was analyzed using The Statistical Package for Social Sciences for windows (SPSS, version 20.0). Chi-square test was used to show association between categorical variables. All statistical tests was 2-tailed and a p-value of <0.05 was considered significant. Prevalence of vitamin D deficiency and insufficiency was found to be 56.1% and 24.5% respectively. Only 19.4% of study participants had normal serum vitamin D level. Adolescent age, female gender and urban residence were found to be significant risk factors for hypovitaminosis D. In conclusion, there is very high prevalence of vitamin D deficiency and insufficiency. High prevalence especially among adolescent, girls and urban children calls for an immediate attention of the nutritional policy makers to address this problem.

KEYWORDS : Hypovitaminosis D, Vitamin D Deficiency, 25 (OH) D, School children

INTRODUCTION:

Vitamin D is a fat soluble vitamin which also functions as hormone. Calciferols are a group of fat soluble compounds and refer to both cholecalciferol (Vitamin D3) and ergocalciferol (Vitamin D2)[1]. Vitamin D in general refers to Vitamin D3. About 90% Vitamin D3 is synthesized endogenously in skin on exposure to sunlight[2]. Endogenous synthesis of vitamin D also depends on atmospheric pollution, Ozone layer, latitude and melanin pigmentation[3]. In general plant based foods are poor source of vitamin D. Animal based foods (oily fish, liver, red meat, egg yolk, etc.) and fortified food like vanaspati are main dietary sources of Vitamin D[4]. Vitamin D is required for bone mineralization, nerve conduction and muscle contraction. It is also required for immune function and many cellular functions[2,5]. Universal presence of vitamin D receptors in most of the body organs, wider extra-skeletal roles for vitamin D has been proposed[6]. Vitamin deficiency may lead to osteoporosis, rickets, osteomalacia and muscle weakness[7].

Extra-skeletal role of vitamin D may include prevention of many chronic illnesses like infectious disease, neoplasm, cardiovascular disease, autoimmune disease, respiratory disease and neurological disorder[3]. The widespread prevalence of vitamin D deficiency even in well sunlit countries coupled with increased access to the vitamin D estimation laboratories has increased the screening of vitamin D deficiency[8-10]. The vitamin deficiency is prevalent across globe; yet, it is one of the most under diagnosed and untreated deficiency disorders[11,12]. Vitamin D deficiency has been reported from both sunshine deficient and sunshine sufficient countries[4].

Epidemiological data from various parts of India has also demonstrated the prevalence of vitamin D deficiency especially among children and adolescents[12-17]. Studies from different parts of India have reported a 53.0%-94.0% prevalence of vitamin D deficiency among school going children[18-23]. Few important modifiable risk factors for hypovitaminosis D includes modern-day lifestyle like more time spent indoors, use of sunscreens, air pollution, traditional clothing[24]. Screening of vitamin D deficiency is specially recommended in pediatric age group who is more prone for its deficiency and consequent impaired bone mineralization[24]. This study aims to find out the prevalence of vitamin D deficiency among children attending pediatric OPD of a tertiary health care facility of Eastern India.

MATERIALS & METHODS:

Methods:

An Institution based, Observational; Cross-Sectional study was conducted among children attending pediatric OPD at IQ City Medical College & Multi specialty Hospital from July-December 2019. A total of 98 study subjects participated in the study. Study was ethically approved by Institutional Ethics Committee, IQ City Medical College & Multi specialty Hospital.

School going children attending pediatric OPD whose legal guardian consented to participate in study was included in study. Children with any severe disease, endocrinal disorders and having clinical signs of vitamin D deficiency were excluded from study. Sample size was calculated using standard World Health Organization (WHO) guideline using $4PD/d^2$. Considering the prevalence (P) of vitamin deficiency 53.0%[23], Q= (1-P), absolute precision of 5 with 95% confidence interval and 10.0% non-response rate minimum sample size came to be 98. Systematic random sampling was used to select the study participants. The Average OPD attendance of pediatric OPD of the IQ City Medical College was 550. The estimated total OPD attendance for the study period was 3300. Sample interval of 34 was obtained by dividing estimated OPD attendance with sample size. Every 34th child was included in the study till desired sample size of 98 study participants was reached. A predesigned, pretested semi structured schedule was used to collect socio demographic data. 2 ml of venous blood samples were collected from antecubital vein using all aseptic measures. Blood sample was centrifuged and serum was stored at -20 degree centigrade. Metabolically stable form of vitamin D i.e 25-Hydroxy vitamin D {25-(OH) D} was measured by enzyme linked fluorescent assay (ELFA) using VIDAS 25-OH vitamin D total testing kits on (Biomerieux, France) on VIDAS automated immunoassay platform[26]. Serum 25 (OH) D was classified as deficient, insufficient, sufficient, therapeutic, and potential toxicity if the serum concentration was <20ng/ml, 20-29ng/ml, 30-60ng/ml, 61-100ng/ml and >100ng/ml respectively[26-27].

Statistical Analysis:

Data were codified and analyzed using The Statistical Package for Social Sciences for windows (SPSS, version 20.0). Frequency of hypovitaminosis D and other clinic-social variables were calculated. Simple bar diagrams were used to show frequency of hypovitaminosis

D and classification of hypovitaminosis D respectively. Data were converted in categorical variables and Chi-square test was used to show association between categorical variables. All statistical tests was 2-tailed and a p-value of <0.05 was considered significant.

RESULTS:

Mean age of the study population was 10.6 ±2.67 years and median vitamin D level was 18.35ng/ml with Inter Quartile Range of 13.45-27.1 ng/ml. 53.1% of study population were female and 46.9% were male (Table-1). 44.9% of study population was in 13-15 year age group followed by 34.7% and 20.4% in the age group of 10-12 years and 7-9 years respectively (Table-1). 59.2% of them were from urban areas and rest was from rural areas (Table-1).

Table: 1- Clinico-Social Characteristics of Study Population, n=98

Clinico-Social Characteristics	n (%)
Age Group	
7-9 years	20 (20.4)
10-12 years	34 (34.7)
13-15 years	44 (44.9)
Gender	
Male	46 (46.9)
Female	52 (53.1)
Residence	
Urban	58 (59.2)
Rural	40 (40.8)
Serum 25 (OH) D Status	
Deficient (<20ng/ml)	55 (56.1)
Insufficient (20-29ng/ml)	24 (24.5)
Sufficient (30-60ng/ml)	19 (19.4)

Only 19 (19.4%) of study participants had serum vitamin D level in normal range. 80.6% of study participants had some form of vitamin D deficiency in which 56.1% of them had deficiency and 24.5% had vitamin D insufficiency (Figure-1).

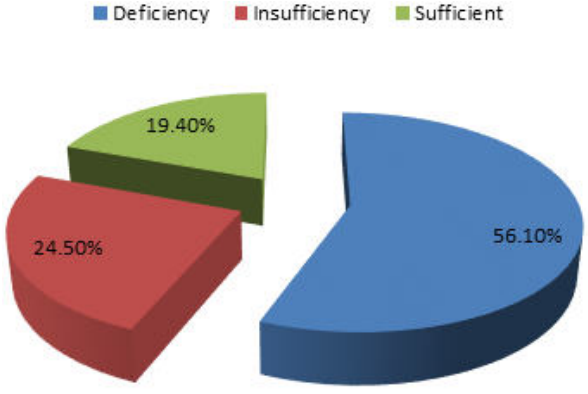

Fig:1- Pie diagram showing prevalence of vitamin D deficiency/ insufficiency among study population (n=98)

Table: 2- Chi-Square test Showing association between serum 25 (OH) D concentration and socio-demographic characteristics (n=98)

	Serum 25 (OH) D			Total n(%)	χ^2 (df)	p-value
	Deficient (%)	Insufficient (%)	Sufficient (%)			
Age Group						
7-9 years	8 (40.0)	3 (15.0%)	9 (45.0)	20(100.0)		
10-12 years	16 (47.1)	13 (38.2)	5 (14.7)	34(100.0)		
13-15 years	31 (70.4)	8 (18.2)	5 (11.4)	44(100.0)	15.7(4)	0.003
Gender						
Male	23 (50.0)	6 (13.0)	17 (37.0)	46(100.0)		
Female	32 (61.5)	18 (34.6)	2 (3.7)	52(100.0)	19.01(2)	0.000
Residence						
Urban	36 (62.1)	16 (27.6)	6 (10.3)	58(100.0)		
Rural	19 (47.5)	8 (20.0)	13 (32.5)	40(100.0)	07.44(2)	0.024

70.5% of 13-15 years age group had vitamin D deficiency as compared to only 47.1% and 40.0% vitamin D deficiency in the 10-12 years and 7-9 years age group respectively. 13-15 years age group had significantly higher vitamin D deficiency the lower age groups (Table-2). 61.5% of girls and 50.0% of boys had vitamin D deficiency. 18.2% of girls had Vitamin D insufficiency and only 13.0% of boys had insufficiency. Female gender was found to be a significant risk factor for vitamin D deficiency and insufficiency (Table-2). Out of 58 urban area study participants 36 (62.1%) had vitamin D deficiency and 16 (27.6%) had insufficiency. 19 (47.5%) of rural area participants had vitamin D deficiency and 8 (20.0%) had insufficiency. Urban residence was significantly associated with high prevalence of vitamin D deficiency and insufficiency (Table-2).

DISCUSSION:

A Cross-Sectional study was conducted among school going children who attended pediatric OPD of a tertiary health care facility of Eastern India. Data were collected from 98 study participants. About 80.4% of study participants either had vitamin D deficiency or insufficiency and only 19.4% of them had normal serum vitamin D level. Anitha A et al reported that only 8.62% of school going children had normal vitamin D level and rest of them either had vitamin D deficiency or insufficiency[28]. About 3/4th of the adolescent had vitamin D deficiency and about 1/5th of adolescent had vitamin D insufficiency. Significantly higher prevalence of vitamin D deficiency among adolescents may be due to the increase demand at this age. Higher prevalence of vitamin D deficiency among adolescents was also reported by few other researchers[18,23]. In this study 61.5% of the girl child had vitamin deficiency as compared to 50.0% among boys. 90.8% prevalence of hypovitaminosis D among school girls was reported by Puri S et al[29]. Vasudevan J et al[18] also reported a higher prevalence of vitamin D deficiency among girls, however Harinarayan et al[17] reported a higher (81.5%) prevalence of hypovitaminosis D among boys. Higher prevalence of hypovitaminosis D among girls may be due to less exposure to sun due to full body clothing. Another reason might be less access to outdoor activities due cultural or security reasons. In this study higher prevalence (62.1%) of hypovitaminosis D was found among urban residents. High prevalence of vitamin D deficiency among urban residents is consistent with the findings reported by Harinarayan et al[17] and Vupputuri et al[30]. Higher prevalence of hypovitaminosis D among urban residents may be due to less sun exposure resulting from air pollution and/or less access to open spaces due to small household and flat system of residential units.

Limitation of study includes tertiary health care facility based study, inclusion of fewer variables and not including other biochemical parameters of nutritional deficiency. Since this is a hospital based study the results cannot be generalized to normal population.

CONCLUSION:

There is high prevalence of vitamin D deficiency among school going children. The deficiency is more common among adolescents, especially among adolescent girls who live in urban areas. Awareness regarding adequate sun exposure and vitamin D rich food intake along with food fortification with vitamin D and vitamin D supplement intake should be promoted to reduce the burden of hypovitaminosis D among school going children.

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