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ORIGINAL RESEARCH

Prevalence of Vitamin D deficiency and associated risk factors among school children residing at high altitude in Ladakh, India

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ABSTRACT

Background: Children's developing bones depend on vitamin D. Vitamin D is involved in several physiological and pathological processes in addition to maintaining bone integrity and absorbing calcium. The present study was conducted to Prevalence of Vitamin D deficiency and associated risk factors among school children residing at high altitude in Ladakh, India. **Materials & Methods:** 240 children of both genders were selected. Parameters such as height, weight, Body mass index (BMI) as weight (kg)/height (m2), socio-economic status (SES), physical activity, sunlight exposure, and dietary pattern was recorded. The biochemical estimation of serum 25-hydroxy Vitamin D ((25OH) D) and intact parathyroid hormone (PTH) was done using chemiluminescence immunoassay using kits. **Results:** Out of 240, 115 were boys and 125 were girls. Out of 115 boys, vitamin D deficiency was seen in 20 (17.3%) and out of 125 girls in 26 (20.8%). Skin pigmentation score 1 was seen in 29, 2 in 10, 3 in 4 and 4 in 3. 30 were taken outdoor and 31were not using sunscreen. Season of visit among children with vitamin D deficiency was spring in 8, summer in 26 and autumn in 12. The difference was significant (P< 0.05). **Conclusion:** Authors found that vitamin D deficiency is a common health problem among children living in Ladakh and the frequency of vitamin D insufficiency was higher in girls than in boys.

Keywords: Children's, vitamin D.

INTRODUCTION

Children's developing bones depend on vitamin D. Vitamin D is involved in several physiological and pathological processes in addition to maintaining bone integrity and absorbing calcium.[1] The major source of Vitamin D is the endogenous synthesis in skin on exposure to sunlight, namely, ultraviolet B (UV-B) radiation of wavelength 290–320 nm. Main dietary sources are fish, fortified food, and supplements. Vegetables and grains are poor sources.Synthesis of vitamin in skin on exposure to UV-B is also affected by latitude, solar zenith angle, atmospheric pollution, ozone layer, and melanin pigmentation.[2]

Numerous noncalcemic uses for vitamin D exist, such as immunological, cardiovascular, endocrine, cognitive, neuromuscular, cellular differentiation, and anticancer effects.[3] Research carried out in India has revealed that among school-age children, vitamin D deficiency (VDD) is highly prevalent (85–98%). The majority of these research were carried out in the nation's plains.[4] Low sun exposure, air pollution, darker skin pigmentation, low physical activity, solitary confinement of youngsters indoors during the day, and high-rise buildings are prominent risk factors linked to VDD.VDD causes poor mineralization of the collagen matrix in young children’s bones leading to growth retardation and bone deformities known as rickets.[5]The present study was conducted to assess Prevalence of Vitamin D deficiency and associated risk factors among school children residing at high altitude in Ladakh, India.

MATERIALS & METHODS

The present study was conducted on240 children residing at high altitude in Ladakh, India.All were

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informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Parameters such as height, weight, Body mass index (BMI) as weight (kg)/height (m2), socio-economic status (SES), physical activity, sunlight exposure, and dietary pattern was recorded. The biochemical estimation of serum 25-hydroxy Vitamin D ((25OH) D) and intact parathyroid hormone (PTH) was done using chemiluminescence immunoassay using kits. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 240		
Gender	**Male**	**Female**
Number	115	125

Table I shows that out of 240, 115 were boys and 125 were girls.

Table II Prevalence of vitamin D deficiency

Gender	Total	Prevalence
Boys	115	20
Girls	125	26

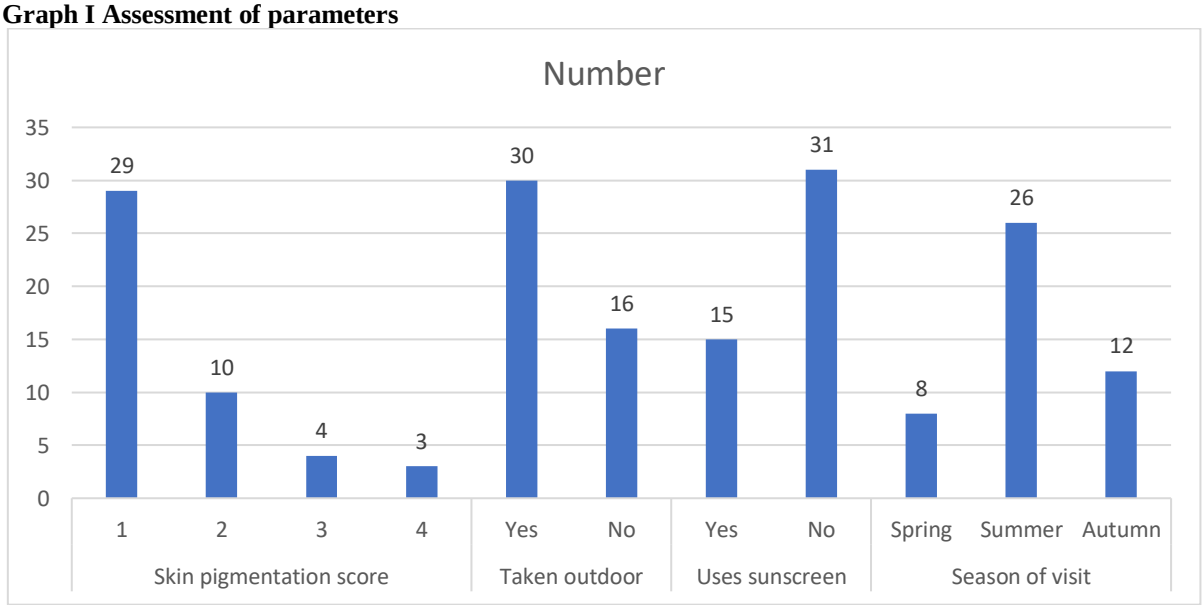
Table II shows that out of 115 boys, vitamin D deficiency was seen in 20 (17.3%) and out of 125 girls in 26 (20.8%).

Table III Assessment of parameters

Parameters	Variables	Number	P value
Skin pigmentation score	1	29	0.01
	2	10	
	3	4	
	4	3	
Taken outdoor	Yes	30	0.02
	No	16	
Uses sunscreen	Yes	15	0.03
	No	31	
Season of visit	Spring	8	0.05
	Summer	26	
	Autumn	12	

Table III, graph I shows that skin pigmentation score 1 was seen in 29, 2 in 10, 3 in 4 and 4 in 3. 30 were taken outdoor and 31were not using sunscreen. Season of visit among children with vitamin D deficiency was spring in 8, summer in 26 and autumn in 12. The difference was significant (P< 0.05).

Graph I Assessment of parameters



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DISCUSSION

Vitamin D is a fat-soluble vitamin, known for its antirachitic activity. Calciferols are a group of lipid-soluble compounds with a 4-ringed cholesterol backbone and refer to both, Vitamin D3, i.e., cholecalciferol and Vitamin D2, i.e., ergocalciferol.[6,7] Vitamin D, in general, refers to Vitamin D3. Vitamin D can be synthesized endogenously. About 90% of the required Vitamin D is synthesized in the skin under sun exposure.[8,9]The active form of Vitamin D stimulates the absorption of calcium in the duodenum and increases calcium influx in distal tubules of kidney through nuclear Vitamin D receptor (VDR); latter is specifically regulated by parathormone level.[10]The present study was conducted to assess prevalence of Vitamin D deficiency and associated risk factors among school children residing at high altitude in Ladakh, India**.**

We found that out of 240, 115 were boys and 125 were girls. Puri et al[11] conducted study on 3,127 apparently healthy Delhi schoolgirls (6-18 years) from the lower (LSES, n 1,477) and upper socioeconomic strata (USES, n 1650). These girls were subjected to anthropometry and clinical examination for hypovitaminosis D. Girls randomly selected from the two strata (LSES, n 193; USES, n 211) underwent detailed lifestyle, dietary, biochemical and hormonal assessment. Clinical vitamin D deficiency was noted in 11.5 % girls (12.4 % LSES, 10.7 % USES). USES girls had significantly higher BMI than LSES counterparts. Prevalence of biochemical hypovitaminosis D (serum 25-hydroxyvitamin D < 50 nmol/l) was seen in 90.8 % of girls (89.6 % LSES, 91.9 % USES, NS). Mean intake of energy, protein, fat, Ca, vitamin D and milk/milk products was significantly higher in USES than LSES girls. Conversely, carbohydrate, fibre, phytate and cereal intakes were higher in LSES than USES girls. Physical activity and time spent outdoors was significantly higher in LSES girls (92.8 v. 64 %, P = 0.000). Significant correlation between serum 25-hydroxyvitamin D and estimated sun exposure (r 0.185, P = 0.001) and percentage body surface area exposed (r 0.146, P = 0.004) suggests that these lifestyle-related factors may contribute significantly to the vitamin D status of the apparently healthy schoolgirls.

We found that out of 115 boys, vitamin D deficiency was seen in 20 (17.3%) and out of 125 girls in 26 (20.8%). Kapil et al[12]assessed the prevalence of VDD and associated risk factors among children in the age group of 6–18 years. A total of626 children in the age group of 6–18 years were enrolled. Ninety-three percent of school-age children were found Vitamin D deficient as per serum 25(OH) D levelsof <20 ng/ml. The prevalence was significantly higher among females.

We found that skin pigmentation score 1 was seen in 29, 2 in 10, 3 in 4 and 4 in 3. 30 were taken outdoor and 31were not using sunscreen. Season of visit among children with vitamin D deficiency was spring in 8, summer in 26 and autumn in 12. Basu et al[13] in their study, serum 25 hydroxycholecalferol (ng/ml) was analyzed in 310 children and adolescents of pediatric hospital. Serum calcium (mg/dl), phosphorous (mg/dl) and alkaline phosphatase (IU/L) data was obtained. Median 25(OH)D was 19 ng/ml. 19.2 % of population had serum 25(OH)D < 10 ng/ml (severe deficiency), 52.9 % had <20 ng/ml (deficiency), 24.5 % had 20–29 ng/ml (insufficiency) and 22.6 % had >30 ng/ml (optimum). Deficiency was highest in adolescents (86.1 %), followed by school children (61.0 %), lowest in pre-school children (41.6 %). 25(OH)D concentrations was lowest in winters ($P = 0.002$) and spring ($P = 0.03$) compared to summer. There was no correlation with calcium ($P = 0.99$), phosphorous ($P = 0.23$) and ALP ($P = 0.63$). There is high prevalence of vitamin D deficiency in children and adolescents of eastern India. Prevalence was lower in younger subjects. 25(OH)D did not correlate with bone mineral markers.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that vitamin D deficiency is a common health problem among children living in Ladakh and the frequency of vitamin D insufficiency was higher in girls than in boys.

Our study emphasizes vitamin-D deficiency as a major public health problem and the need for supplementation, food fortification and educating the population as initiatives required to improve sufficiency status.

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