

## ORIGINAL RESEARCH

# Comparison of the Vitamin D Status of Children Younger and Older Than 2 Years

<sup>1</sup>Dr. Kumar Sanjeev, <sup>2</sup>Dr Vijay Kumar, <sup>3</sup>Dr. Suryendru Kumar

<sup>1-3</sup>Senior Resident, Department of Pediatrics, ESIC Medical College & Hospital, Bihta, Patna, Bihar, India

## Correspondence Author

Dr. Suryendru Kumar

Senior Resident, Department of Pediatrics, ESIC Medical College & Hospital, Bihta, Patna, Bihar, India

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## ABSTRACT

**Background:** Vitamin D is a lipid-soluble vitamin that is known to play an important role in bone metabolism through the regulation of calcium and phosphate homeostasis. Thus, insufficiency or deficiency of this vitamin can have long-term effects, particularly for children. The present study was conducted to compare vitamin D status of children younger and older than 2 years.

**Material and Methods:** The present study was conducted among 200 healthy children younger and older than 2 years to compare Vitamin D Status in them. Children were divided into two groups i.e. group A was children younger than 2 years and group B was children older than 2 years. Blood levels of vitamin D were then measured. The data were analyzed using the statistical package for social sciences (SPSS), version 16 (SPSS Inc. Chicago, IL, USA) for Windows. A P value of less than 0.05 considered statistically significant.

**Results:** In the present study children were divided into two groups i.e. group A was children younger than 2 years and group B was children older than 2 years. 60% children younger than 2 years were males and 40% were females whereas 55% children older than 2 years were males and 45% were females. Mean age of children younger than 2 years was 1.23 years and children older than 2 years was 3.45 years. Mean levels of Vitamin D was more in children younger than 2 years (28.72 ng/ml) than children older than 2 years (16.13 ng/ml). In children younger than 2 years, 46 children had normal vitamin D levels, 47 children had insufficient levels and 7 children had deficient vitamin D levels. In children older than 2 years, 15 children had normal vitamin D levels, 43 children had insufficient levels and 42 children had deficient vitamin D levels. In 33.91% males and 25.88% females, vitamin D levels were normal. In 42.60% males and 48.23% females vitamin D levels were insufficient and in 23.47% males and 25.88% females vitamin D levels were deficient.

**Conclusion:** The study concluded that children older than 2 years had more children who had deficient vitamin D levels than children younger than 2 years. Females had less levels of vitamin D than males.

**Keywords:** Vitamin D levels, children older than 2 years, children younger than 2 years.

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## INTRODUCTION

Calciferol, also known as vitamin D, is a vital lipid-soluble vitamin in the body, helping the growth and development of bones by inducing phosphorus and calcium absorption by the intestine and decreasing calcium secretion by the kidneys. It also plays a role in gene translation in the process of cell growth.<sup>1,2</sup> The major source of vitamin D for humans is exposure to sunlight.<sup>3</sup> Unfortified foods naturally containing vitamin D are limited. The best food sources are animal products, particularly fatty fish and liver extracts like salmon or sardines and cod liver oil.<sup>4</sup> For infants, breast milk is the best source of vitamin D.<sup>5</sup> It is generally accepted that serum 25-hydroxyvitamin D (25(OH)D) is

a reliable measure of an individual's vitamin D status. Serum total 25(OH) D concentration is the sum of the 25(OH) D<sub>3</sub> and 25(OH)D<sub>2</sub> concentrations. Various methods such as Radioimmunoassay (RIA), Chemiluminescence immunoassay, Enzyme-Linked Immunosorbent Assay (ELISA), and protein binding assays are used for measurement of 25(OH) D concentrations. However, High-Performance Liquid Chromatography (HPLC) or tandem mass spectrometry are considered to be the gold standard for the assessment of 25(OH)D<sub>3</sub>.<sup>5</sup> In infants and young children Vitamin D plays an important role in bone mineralization hence its deficiency leads to rickets, hypocalcemia symptoms and osteomalacia in older

adolescents and adults. As many studies in India have proved that the prevalence of vitamin D deficiency in India ranges from 50 % to 90 %.<sup>6</sup> the present study was conducted to compare vitamin D status of children younger and older than 2 years.

### MATERIAL & METHODS

The present study was conducted among 200 healthy children younger and older than 2 years to compare Vitamin D Status in them. Before the commencement of the study ethical clearance was taken from the Ethical Committee of the institute and informed consent was taken from the parents and guardians of the children. Children were divided into two groups i.e. group A was children younger than 2 years and group B was children older than 2 years. Healthy children who attended the OPD for routine checkups were enrolled in this study. Children with complaints of musculoskeletal pain, endocrine or infectious diseases, chronic kidney disease, or evidence of malnutrition were excluded from the study. Children with underlying diseases, such as renal and hepatic disorders, and those with a history of

taking antiepileptic drugs were also excluded from the study. Blood levels of vitamin D were then measured. All the laboratory parameters were measured using the kit (Liuison, Diasorin Inc.), with the chemiluminescence method. Based on the level of vitamin D, it was classified as: deficiency (less than 30 ng/mL) or normal (more than 30 ng/mL).<sup>7</sup> the data were analyzed using the statistical package for social sciences (SPSS), version 16 (SPSS Inc. Chicago, IL, USA) for Windows. A P value of less than 0.05 considered statistically significant.

### RESULTS

In the present study children were divided into two groups i.e. group A was children younger than 2 years and group B was children older than 2 years. 60% children younger than 2 years were males and 40% were females whereas 55% children older than 2 years were males and 45% were females. Mean age of children younger than 2 years was 1.23 years and children older than 2 years was 3.45 years.

**Table 1: Demographic data**

Parameters	Younger Than 2 Years (N = 100)	Older Than 2 Years (N = 100)	Total (n=200)
Gender			
Male	60	55	115
Female	40	45	85
Mean age (years)	1.23	3.45	2.34

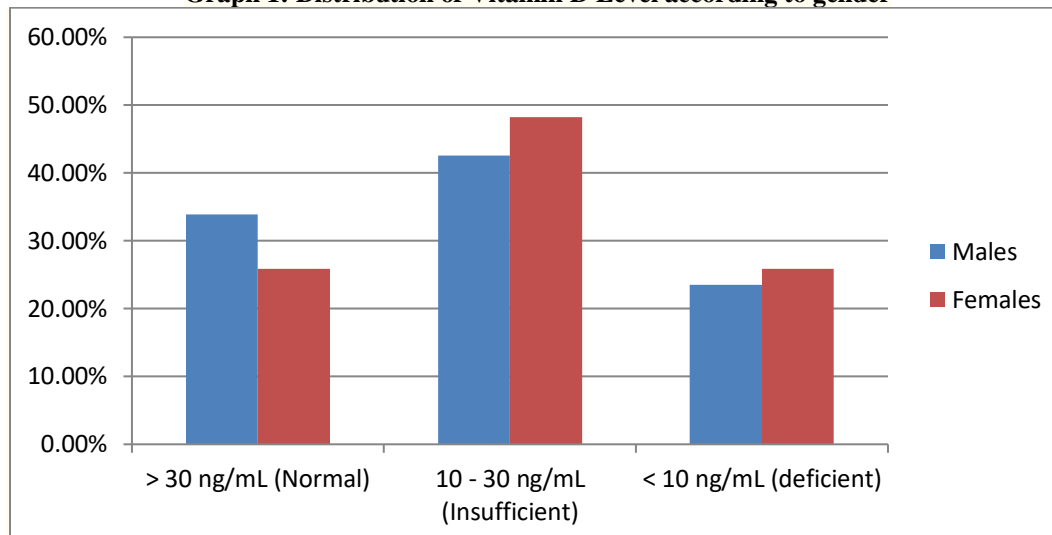
**Table 2: Distribution of Vitamin D Level in the Two Age Groups**

Level of Vitamin D	Younger Than 2 Years (N = 100)	Older Than 2 Years (N = 100)	P Value
Mean level, ng/mL	28.72±13.65	16.13±14.06	0.0001
> 30 ng/mL (Normal)	46	15	0.0001
10 - 30 ng/mL (Insufficient)	47	43	0.001
< 10 ng/mL (deficient)	7	42	0.0001

Mean levels of Vitamin D was more in children younger than 2 years(28.72ng/ml) than children older than 2 years (16.13ng/ml). In children younger than 2 years, 46 children had normal vitamin D levels, 47 children had insufficient levels and 7 children had deficient vitamin D levels. In children older than 2 years, 15 children had normal vitamin D levels, 43 children had insufficient levels and 42 children had deficient vitamin D levels.

**Table 3: Distribution of Vitamin D Level according to gender**

Level of Vitamin D	Males	Females
> 30 ng/mL (Normal)	39(33.91%)	22(25.88%)
10 - 30 ng/mL (Insufficient)	49(42.60%)	41(48.23%)
< 10 ng/mL (deficient)	27(23.47%)	22(25.88%)

**Graph 1: Distribution of Vitamin D Level according to gender**

In 33.91% males and 25.88% females, vitamin D levels were normal. In 42.60% males and 48.23% females vitamin D levels were insufficient and in 23.47% males and 25.88% females vitamin D levels were deficient.

## DISCUSSION

Vitamin D deficiency with a resurgence of rickets is increasingly being reported in infants and toddlers from various parts of the world despite food fortification policies in many countries.<sup>6</sup> The prevalence of hypovitaminosis D ranged from 84.9 to 100 % among school going children, 42 to 74 % among pregnant women, 44.3 to 66.7 % among infants 70 to 81.1 % among lactating mothers and 30 to 91.2 % among adults.<sup>8</sup> In the present study children were divided into two groups i.e. group A was children younger than 2 years and group B was children older than 2 years. 60% children younger than 2 years were males and 40% were females whereas 55% children older than 2 years were males and 45% were females. Mean age of children younger than 2 years was 1.23 years and children older than 2 years was 3.45 years. Mean levels of Vitamin D was more in children younger than 2 years (28.72 ng/ml) than children older than 2 years (16.13 ng/ml). In children younger than 2 years, 46 children had normal vitamin D levels, 47 children had insufficient levels and 7 children had deficient vitamin D levels. In children older than 2 years, 15 children had normal vitamin D levels, 43 children had insufficient levels and 42 children had deficient vitamin D levels. In 33.91% males and 25.88% females, vitamin D levels were normal. In 42.60% males and 48.23% females vitamin D levels were insufficient and in 23.47% males and 25.88% females vitamin D levels were deficient. Torkaman M et al investigated the vitamin D status of children younger and older than 2 years and determine the utility of prescribing vitamin D supplements. The final study consisted of 286 children, 140 males and

146 females, with a mean age of  $4.46 \pm 2.82$  yr. Of these, 218 (76.22%) children, with a mean age of  $5.09 \pm 2.82$  yr, had vitamin D deficiency, and 76 children (23.78%), with a mean age of  $2.58 \pm 1.88$  yr, had normal vitamin D levels ( $P = 0.001$ ). The mean level of vitamin D was  $29.71 \pm 14.42$  ng/mL in 88 (30.8%) patients up to 2 years and  $17.11 \pm 14.02$  ng/mL in 198 (69.2%) patients older than 2 years ( $P = 0.0001$ ). The study concluded that the vitamin D levels of children aged more than 2 years are lower than those of children aged less than 2 years.<sup>9</sup> Al-Qahtani et al determined the prevalence of vitamin D deficiency in children up to 2 years of age and investigate the independent predictors of vitamin D deficiency. Overall, vitamin D deficiency was observed in 70.5% of the children, of whom 45.9% had insufficient levels, and one-fourth (24.6%) showed deficiency. The children aged 2–12 months (infants) were more likely to be vitamin deficient compared to children aged 12 months and above. The children who lived in urban areas had a threefold increased risk of vitamin D deficiency (aOR = 3.0, 95% CI 1.78–5.08). The children who were exposed to sunlight for less than 3 days per week experienced a higher risk of developing vitamin D deficiency (aOR = 4.17, 95% CI 2.04–10.88). Children who had received only breast milk were more than two times more likely to experience vitamin D deficiency (aOR = 2.42, 95% CI 1.12–5.23) compared to their counterparts.<sup>10</sup> Lukose R et al did a study with aim to find the prevalence of vitamin D deficiency in a random population and the efficacy of routine vitamin D administration in preventing vitamin D deficiency. METHODS 48 children ranging from 2 months to 5

years who attended a medical camp were selected and their 25-OH vitamin D levels were determined. A detailed history regarding their diet and routine vitamin D supplementation was taken. **RESULTS** In the sample studied, only 8.3 % of children were vitamin D deficient and 10.4 % of children were vitamin D insufficient. Of the 9 children who were on supplements for more than 6 months, none developed vitamin D deficiency or insufficiency. Children born to multipara were more prone to develop vitamin D insufficiency (p value of 0.046).<sup>11</sup> In a study of 1,111 school-aged children, there was a high prevalence of vitamin D deficiency (86%) in both genders but especially in girls.<sup>12</sup> The prevalence of vitamin D deficiency was reported to be 53.6% in females and 11.3% in male children and adolescents in Tehran.<sup>13</sup> Contrary to our study, this study of frequency of vitamin D deficiency in children concluded that the mean level of vitamin D was significantly higher in males than in females.<sup>14</sup> In 2008, in response to the growing evidence of vitamin D deficiency in children, the AAP recommended at least 10 µg/day vitamin D for all children.<sup>15</sup> In 2010, the IOM recommended at least 15 µg/day for children over 1 year of age.<sup>16</sup>

## CONCLUSION

The study concluded that children older than 2 years had more children who had deficient vitamin D levels than children younger than 2 years. Females had less levels of vitamin D than males.

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