

Correlation of vitamin D deficiency with asthma in pediatric population in eastern India

Abstract

Novel role of Vitamin D in non-musculoskeletal health is an area of continued clinical research. Role of Vitamin D in pulmonary homeostasis have been proven beyond doubt. The present study was done in Eastern Indian pediatric population with an objective of finding a correlation between vitamin D deficiency and clinically proven asthma. The study demonstrates a strong association of asthma with vitamin D deficiency ($p < 0.001$), however no association could be proven between severity of asthma and vitamin D deficiency.

Background: The normal vitamin D levels for non-musculoskeletal health have not been defined. Levels less than 20ng/ml have been recently termed as vitamin D deficient state. It has been evident that vitamin D stimulates type 2 alveolar cells for synthesis of DNA, production of surfactant² and regulates alveolarization.³ Several experimental and human studies have suggested that vitamin D protects from severe asthma by preventing viral infection and enhanced response to steroids which favors the inverse association between vitamin D status and severe asthma exacerbation in children.

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Objective

- To determine the incidence of vitamin D deficiency in Indian children with clinically proven asthma as compared to healthy controls.
- To study the association of vitamin D deficiency with the clinical correlates of asthma.

Methods

Design: Case control prospective study

Setting: Ambulatory asthma clinic at Institute of child health

Approval: Ethical committee of Institute Child Health

Time frame: 1 year

Inclusion Criteria: Children 1 to 14 years of age with clinically proven asthma as classified according to GINA (Global Initiative for Asthma) guidelines.

Exclusion Criteria: Children with co-existing rickets, renal diseases or on Vitamin D supplements or steroids

Tools: Analysis of serum 25(OH) D (ng/ml) levels by electrochemiluminescence method

Statistical Analysis: Mann-Whitney U test, Fisher's exact test, Spearman's rank correlation analysis, $p < 0.05$ considered significant

Results

Number: 100 asthma patients as cases, 36 healthy patients as controls

Age: 20 cases were between 1 to 5 years of age while the rest 80 were between 5 to 14 years of age

Vitamin D levels: Cases (16.04 ng/ml \pm 3.2) as compared with the control group (22.67 ng/ml \pm 8.9) ($p < 0.001$), Figure 1.

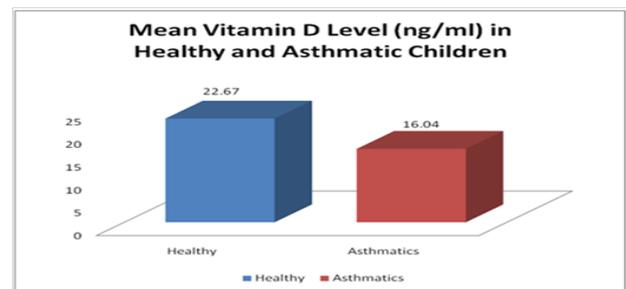


Figure 1 Comparison of Vitamin D Levels in Asthmatics and Healthy Children.

Place of residence: 32 cases lived in rural areas out of which 21 (66%) were Vitamin D deficient. 68 Cases were from urban area out of which 54 (79%) were Vitamin D Deficient (p value 0.994), Figure 2.

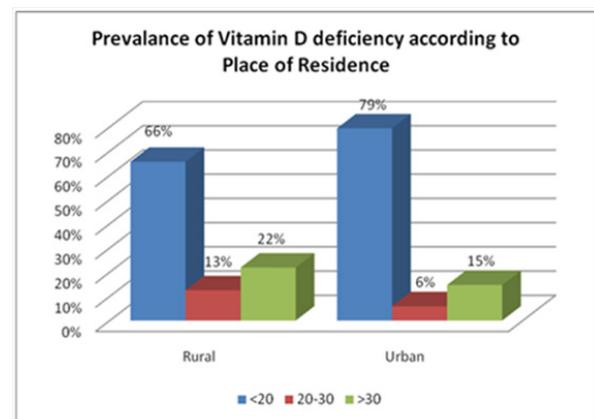


Figure 2 Prevalence of Vitamin D deficiency according to Place of Residence.

Grades of asthma: Patients were classified into Controlled, Partially controlled and uncontrolled asthma. Grade of asthma severity was compared with vitamin D levels. In the controlled asthma group, 12 out of 13 patients were vitamin D deficient. In the partially controlled group 60 out of 83 patients were vitamin D deficient. In the uncontrolled group there were only 3 out of 4 patients were deficient, Figure 3.

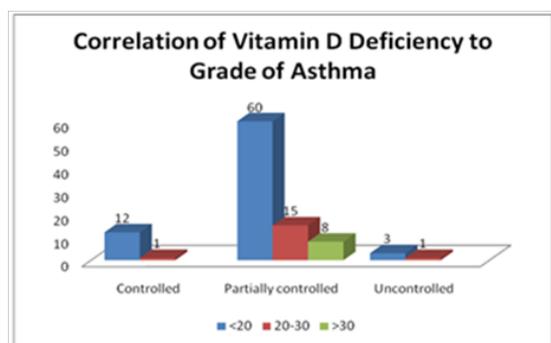


Figure 3 Correlation of Vitamin D Deficiency to Grade of Asthma.

Sunlight exposure: Exposure to sunlight was measured as the duration of exposure between 10 A.M to 3 P.M. It was divided into three groups of 0-15 minutes, 16-60 minutes and >60 minutes. Out of 44 patients with an exposure of 0-15 mins 27 had vitamin D deficiency. In the 16-60 min group there were 48 patients out of which 41 had vitamin D deficiency. The group with >60 mins exposure had 8 patients of these 7 were deficient. There was no correlation between sun exposure and vitamin D deficiency (p value=0.316), Figure 4.

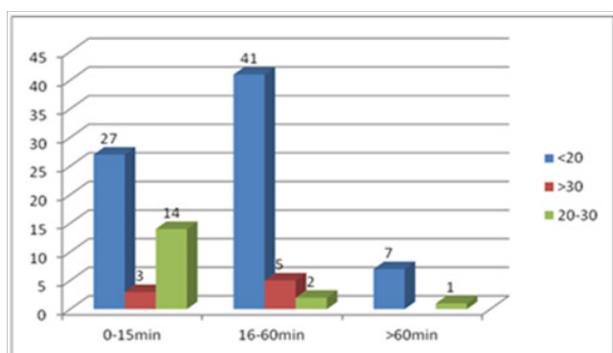


Figure 4 Sunlight Exposure in Patients with different levels of Vitamin D.

Discussion

This study demonstrated that vitamin D deficiency is more prevalent in asthmatic children as compared to the healthy controls. This study was comparable to other studies where a similar result had been found. Children with asthma who take vitamin D supplements have been reported in many studies to have fewer asthma exacerbation episodes⁴. Although a definite causal relationship has not been established, many reports have been published with strong co-association of low vitamin D levels and uncontrolled asthma.^{5,6} There has been noted an inverse relationship between asthma related morbidity and oral intake of vitamin D supplements in all children with vitamin D deficiency with or without asthma.⁷ Vitamin D and asthma are common conditions

that share risk factors such as urban residence, obesity, and African American ethnicity. However no statistical correlation was found in between urban residence and vitamin D deficiency. Some studies have found significant association between asthma severity and vitamin D deficiency.^{8,9} The present study could not find a significant association between the same which can be attributed to low number of uncontrolled asthma cases. Transcutaneous production under the effect of sunlight remains the primary source of cholecalciferol, consumption of vitamin D rich food constitutes as a secondary source. In tropical countries like India most of the patients are expected to get sufficient sun exposure. But surprisingly it was found that majority of the patients did not get adequate sun exposure. This is probably due to urbanization and apprehension of the parents to expose asthmatic children to outdoor environment. The present study could not establish a statistically significant association (p value=0.316) between the levels of vitamin D and sunlight exposure. This can be attributed to various other factors and mechanisms which determine levels of vitamin D in patients of asthma.

Conclusion

Apart from its musculoskeletal role vitamin D is recently becoming known as the underlying mediator in a number of immune and inflammatory disorders. There is a definite correlation between vitamin D deficiency and asthma in children. However the role of vitamin D supplementation in control and management of asthma needs further studies. The route of supplementing vitamin D in such cases and whether the dosing will be the same as used for skeletal health problems like rickets also needs investigation. To the best of author's knowledge this is the first study available which looks at the Eastern Indian population.

Acknowledgements

None.

Conflict of interest

The author declares there is no conflict of interest.

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