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To study the impact of vitamin D levels on asthma severity and absolute eosinophil count

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Abstract
Objective: To study the association between vitamin D levels and asthma severity and to correlate it with Absolute Eosinophil Count
Method: This is a cross sectional study done in SSIMS and RC, Davangere over a period of 2 years. A total of 100 proven cases of asthma were chosen as the study sample. All these cases were subjected to estimation of vitamin D levels and AEC. The study group was divided into vitamin D deficient (<20ng/ml), vitamin D insufficient (between 20ng/ml and 30ng/ml) and vitamin D sufficient (>30ng/ml) group. AEC of >350 was taken as high value. The effect of vitamin D deficiency and insufficiency on severity of asthma and AEC was estimated.
Results: Out of the study population 37% had vitamin D deficiency, 22% had vitamin D insufficiency and 41% had sufficient vitamin D levels. All cases with vitamin D deficiency and 72% of individuals with vitamin D insufficiency had AEC >350 which was statistically significant. All cases of severe persistent asthma and 82% of moderate persistent asthma had vitamin D deficiency.
Conclusion: Severity of asthma increases with vitamin D deficiency and low vitamin D levels are associated with raised absolute eosinophil counts.

Keywords: Vitamin D deficiency, Bronchial Asthma, Absolute Eosionphil Count

Introduction

Asthma is one of the most common diseases affecting millions of population
globally. It is a chronic respiratory disease characterized by increased airway inflammation and hyper-responsiveness. Allergen exposure results in the activation of various cells of our immune system, among them dendritic cells (DCs), Th2 lymphocytes and cytokines play an important role. IgE is also a central player in the allergic response.
Vitamin D is of paramount interest in asthma due to its immunomodulatory effects. Serum 25-hydroxyvitamin D is found to be associated with a wide range of pulmonary diseases. Several researches have reported positive associations between vitamin D and asthma. The role of vitamin D in asthma is not yet clear. Few cross-sectional surveys had suggested a probable link between asthma and vitamin D [1, 2]. Studies have concluded that decreased level of serum 25(OH)D is correlated with an increased prevalence, hospitalization, and increased emergency visits along with declined lung function and increased airway hyperresponsiveness in asthmatic children [1, 3]. Clinical trials conducted in recent times have shown the protective influence of vitamin D supplementation among asthmatic patients. [4, 5, 6].
Several dietary hypotheses have been proposed in context with asthma [7, 8]. and among them vitamin D status is of particular interest. Studies suggest that there is a probable relationship between vitamin D status and asthma-related symptoms presumably via the immunemodulatory effects of vitamin D [7, 9].
Elevated eosinophils exist in the airways of most of the asthmatics. They are composed of inflammatory enzymes. They can generate leukotrienes, and can express a wide variety of pro-inflammatory cytokines. Elevated eosinophil count often correlates with increased asthma severity
Hence study was done to study the association between vitamin D levels and asthma severity and to correlate it with Absolute Eosinophil Count.
Eosinophils have long been associated with the effector arm of T-helper type 2 (Th2) cell immunity engaged in allergic responses
However, a correlation between serum 25(OH) D_3 levels and circulating eosinophils is not strongly established
A few studies have noted that lower levels of vitamin D are associated with an increased blood eosinophil count
But most other studies have reported no significant association

Materials and Methods

Study type: Prospective study conducted at SSIMS & RC, Davangere, Karnataka.
Study period: 2 years
Sample size: 100 proven cases of persistent asthama

Source of data

Inclusion criteria

Children with diagnosed persistent Asthma in the age group of 1 to 18 yrs., admitted in the wards or attending the

Asthma clinic on OPD basis in SSIMS & RC, Davangere, Karnataka were included in the study.
Classification of persistent asthma was done as per guidelines given in Nelson textbook of paediatrics

Exclusion criterion
Children with other co–morbidities like
- cardiac disease,
- tuberculosis
- epilepsy and stroke,
- cerebral palsy,
- hepatic disease
- renal disease.
- children on Vitamin D and Calcium supplements

Sampling method:
Children with persistant asthma, attending the asthma clinic on OPD basis and those admitted in the wards in SSIMS & RC, Davangere, Karnataka were included in the study. Hundred cases of persistent asthma, diagnosed clinically were studied. Enrolled cases were followed up till November 2017 and were characterised on the basis of age, gender, BMI, asthma severity and frequency of asthma exacerbations.
All cases were subjected to estimation of vitamin D levels and absolute eosinophil count. Thereafter, on the basis of statistics, the correlation between vitamin D and the frequency of asthma exacerbation and absolute eosinophil count was done

Method of collection of data
Materials: Baseline height, weight and clinical examination were recorded.
If the cases have been subjected to investigations like CBC, chest x ray previously, theses reports were considered.
Consent was obtained from the parents after explaining them about the study in detail.
Estimation of vitamin D levels was done. Blood samples was centrifuged to separate serum and stored at -200 C if there was a delay of more than 24 hours in performing the test. Serum was then analysed by chemiluminescence assay. Vitamin D levels were assayed in the same manner as per vitamin D standardization programme. Results were subjected to statistical analysis.
These 100 children were subjected to estimation of vitamin D levels and Absolute Eosinophil Count
The study group was divided into vitamin D deficient (<20ng/ml), vitamin D insufficient (between 20ng/ml and 30ng/ml) and vitamin D sufficient (>30ng/ml) group
AEC of >350 was taken as high value
The effect of vitamin D deficiency and insufficiency on severity of asthma and AEC was estimated.
Data collected: Vitamin D levels will be analysed with age, gender, AEC, BMI, frequency of asthma exacerbations and asthma severity. This data was compared between the two groups. Statistical analysis was performed using SPSS software, version 16.

Results

Table 1: Association between vitamin D levels and AEC

AEC	Vitamin D			Total	p value
	Deficiency	Insufficiency	Sufficiency		
≤350	0	6	36	42	0.000
	0.0%	14.3%	85.7%	100.0%	
>350	37	16	5	58	
	63.8%	27.6%	8.6%	100.0%	
Total	37	22	41	100	
	37.0%	22.0%	41.0%	100.0%	

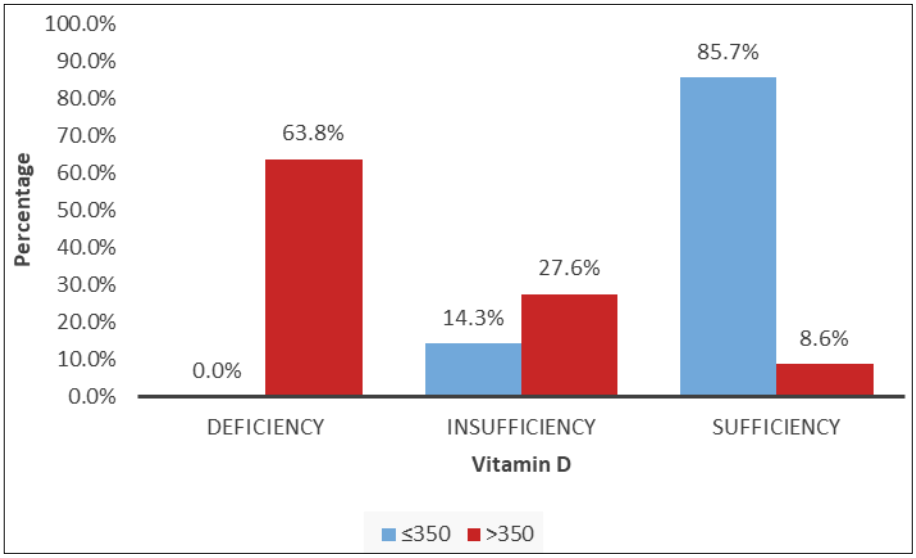

Fig 1

There was a significant correlation between vitamin D levels and absolute eosinophil count. 63.8% with AEC>350 had vitamin D deficiency and 27.6% had vitamin D insufficiency

Table 2: Association between vitamin D levels and asthma severity

Asthma severity	Vitamin d			Total	P value
	Deficiency	Insufficiency	Sufficiency		
Mild	0	22	37	59	0.000
	0.0%	37.3%	62.7%	100.0%	
Moderate	19	0	4	23	
	82.6%	0.0%	17.4%	100.0%	
Severe	18	0	0	18	
	100.0%	0.0%	0.0%	100.0%	
Total	37	22	41	100	
	37.0%	22.0%	41.0%	100.0%	

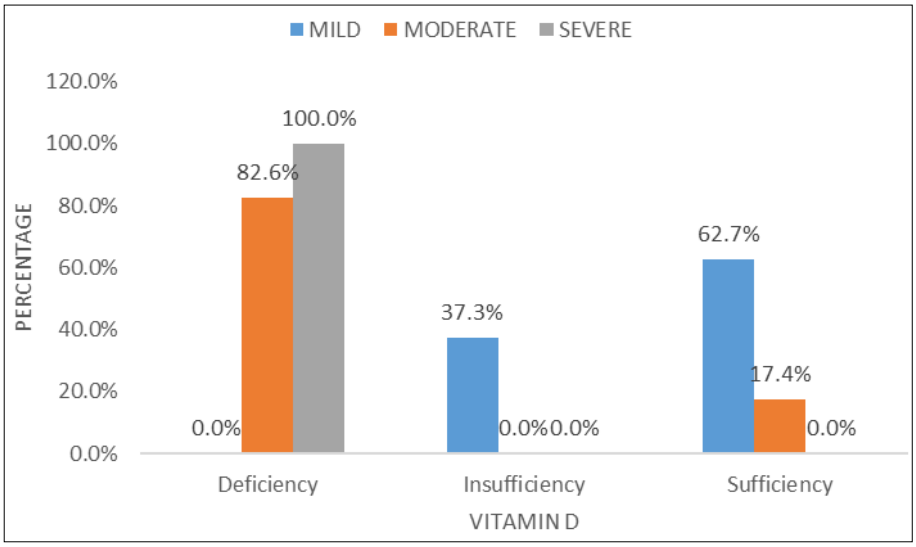

Fig 2

There is a significant correlation between vitamin D levels and asthma severity (p= 0.000) where all cases with severe persistent asthma had vitamin D deficiency. 82.6% cases of moderate persistent asthma had vitamin D deficiency and 37.35 cases of mild persistent asthma had vitamin D insufficiency. Rest of the study group had sufficient vitamin D level

Discussion

Bronchial asthma is the most common cause of respiratory problems and leading cause of morbidity in children in the whole world. A number of studies have been done to study the factors responsible for asthma exacerbations, and one among them that is gaining increased importance is vitamin D deficiency. Many studies have reported that low serum vitamin D levels have been associated with increased symptoms, exacerbations and decreased lung function.

The present study was intended to determine the relationship between vitamin D levels with asthma severity and absolute eosinophil count.

In our study, there were a total of 100 persistent asthmatics. The age group chosen was from 1 yr to 18yrs. Mean age in years+-SD of the study group was 10.81+-2.7. In the current study, 46% of the patients were males and 54% of the patients were females

In the study a significant positive correlation was found between Vitamin D levels and the absolute eosinophil counts with 58% having AEC above 350. It was in accordance to the Costa Rican study that had shown that Vitamin D deficiency was associated with markers of allergy and asthma like high AEC and serum IgE levels. This was in contrast to the CAMP study which did not prove any relation between the same

In our study there was a significant inverse correlation between serum Vitamin D levels and severity of asthma (p= 0.00). All the cases of severe persistent asthma had vitamin D deficiency. 82.6% cases of moderate persistent asthma had vitamin D deficiency and 37.35% cases of mild persistent asthma had vitamin D insufficiency. Rest of the study group had sufficient vitamin D level. In low vitamin D levels, there was increased severity of asthma. It was similar to the findings of the study done by Chinellato *et al.* [10], Gupta *et al.* [11] and Brehm *et al.* [12, 13] It was suggested in this study that low vitamin D levels, due to down regulation of glucocorticoid pathway leads to increased need of steroid doses and this itself leads to increased asthma severity

Brehm *et al.* [12, 13]. Showed that low Vitamin D levels were associated with increased frequency of exacerbations. Our study also found out a significant positive correlation between increased risks of exacerbations and Vitamin D deficiency.

(p=0.00) Sufficient Vitamin D levels are likely associated with decreased risk of severe exacerbations through multiple mechanisms. One mechanism may be through improved response to respiratory infections, since Vitamin D has been shown to induce the production of antimicrobial proteins (AMPs), such as cathelicidin and defensing (p= 0.00). Induction of AMPs has been shown to occur at the airway epithelium. In addition to the induction of AMPs, Vitamin D may modulate the inflammatory response to viral infections.

Conclusion

- Our study has shown a high prevalence of Vitamin d deficiency and insufficiency in asthmatics.

- There was a significant correlation between the severity of asthma and Vitamin D levels. Low vitamin D levels were associated with increased severity
- There was a strong positive correlation between AEC levels and Vitamin D levels showing that Vitamin D deficiency increases the markers of allergy

References

1. Baeke F, Takiishi T, Korf H, *et al*. Vitamin D: modulator of the immune system. Curr Opin Pharmacol. 2010; 10:482-496. 10.1016/j.coph. 2010.04.001
2. Chinellato I, Piazza M, Sandri M, *et al*. Vitamin D: serum levels and markers of asthma control in Italian children. J Pediatr. 2011; 158:437-441. 10.1016/ j.jpeds.2010.08.043
3. Devereux G, Wilson A, Avenell A, *et al*. A case-control study of vitamin D status and asthma in adults. Allergy. 2014; 65:666-667. 10.1111/j.1398-9995. 2009. 02220.x
4. Urashima M, Segawa T, Okazaki M, *et al*. Randomized trial of vitamin D supplementation to prevent seasonal influenza A in schoolchildren. Am J Clin Nutr. 2010; 91:1255-1260. 10.3945/ajcn.2009.29094
5. Majak P, Olszowiec-Chlebna Mg, Smejda K, *et al*. Vitamin D supplementation in children may prevent asthma exacerbation triggered by acute respiratory infection. J Allergy Clin Immunol. 2011; 127:1294-1296. 10.1016/j.jaci.2010.12.016
6. Yadav M, Mittal K. Effect of vitamin D supplementation on moderate to severe bronchial asthma. Indian J Pediatr. 2014; 81:650-654. 10.1007/s12098-013-1268-4.
7. Nurmatov U, Devereux G, Sheikh A. Nutrients and foods for the primary prevention of asthma and allergy: systematic review and meta-analysis. J Allergy Clin Immunol. 2011; 127:724-733. 10.1016/j.jaci.2010. 11.001
8. Herr C, Greulich T, Koczulla RA *et al*. The role of vitamin D in pulmonary disease: COPD, asthma, infection, and cancer. Respir Res. 2011; 12:31. 10.1186/1465-9921-12-31
9. Shifren A, Witt C, Christie C *et al*. Mechanisms of remodeling in asthmatic airways. J Allergy, 2012, 12. 10.1155/2012/316049
10. Chinellato I, Piazza M, Sandri M *et al*. Vitamin D serum levels and markers of asthma control in Italian children. J Pediatr. 2011; 158:437-441. 10.1016/j.jpeds.2010.08.043
11. Gupta A, Sjoukes A, Richards D, Banya W, Hawrylowicz C, Bush A *et al*. Relationship Between Serum Vitamin D, Disease Severity and Airway Remodeling in Children with Asthma. Am J Respir Crit Care Med. 2011; 184(12):1342-9.
12. Fu L, Yun F, Oczak M *et al*. Common genetic variants of the vitamin D binding protein (DBP) predict differences in response of serum 25-hydroxyvitamin D[25(OH)] to vitamin D supplementation. Clin Biochem. 2009; 42:1174-7.
13. Provvedini M, Tsoukas D, Deftos J, Manolagas C1. 25 dihydroxyvitamin D3 receptors in human leukocytes. Science. 1983; 221:1181-3.