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Original Research Paper

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STUDY OF VITAMIN D LEVELS IN PATIENTS WITH BRONCHIAL ASTHMA

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ABSTRACT

Introduction: Bronchial Asthma is one of the oldest diseases yet its recognised as a major public health problem which cannot be cured but can be maintained, provided apt and correct treatment and style life management has been followed. This study is about the relation between vitamin D levels with bronchial asthma and to find out whether mere supplementation of the vitamin along with inhalers can prove beneficial to all bronchial asthma patients who has been stabilised with their own management, in view of asthma control and lung function. **Methods & Materials:** This is a cross-sectional study where in 55 patients were taken up for the study by OPD follow up in a tertiary care centre, after looking into the inclusion and exclusion criteria and were prescribed with vitamin D supplements and ACT scores and PFT values were recorded and analysed pre and post supplementation. **Results:** It was found out that in our study, there was significance in bronchial asthma patients with low vitamin D levels, but its supplementation had created an improvement of ACT scoring from 18.76 ± 1.42 to 21.16 ± 1.55 and in regard of FEV1 in spirometry there was an improvement from 59.58 to 67.21 post supplementation. **Conclusion:** This study proves that vitamin D supplementation does cause beneficial effects on the performance of stabilised bronchial asthma patient in the long run.

KEYWORDS : Asthma, Vitamin D supplementation, ACT score, GINA

INTRODUCTION:

"Bronchial Asthma is a heterogeneous disease usually characterized by chronic airway inflammation. It is defined by history of respiratory symptoms such as wheeze, shortness of breath, chest tightness that vary over time and in intensity together with variable expiratory air flow limitation".[1] It is characterized by bronchial hyper-responsiveness and variable airflow obstruction, that is often reversible either spontaneously or with treatment. It is one of the oldest known diseases which has been recognised as a major public health problem since the mid-1970s and since then it has been now recognized as a major cause of disability but a preventable death.

Of the different allergic disorders, perhaps asthma has been the most closely examined in the context of vitamin D. Although the underlying mechanisms of how vitamin D modulates the pathogenesis of asthma have not been completely understood, the available data suggest an association between vitamin D deficiency and asthma. The role of vitamin D in airway immunity has been much studied such that its active form causing increased differentiation and recruitment of macrophages enhanced production of cathelicidin and CD14.[2]

Vitamin D also modulates and suppress production of IgE and mast cell activation, reducing histamine and tumour necrosis factor-α release. They also inhibit smooth muscle cell proliferation as well as inhibit production of inflammatory mediators thereby acting at the biochemical level of asthma pathogenesis. Due to these factors, vitamin D deficiency has been associated with increased airway hyper responsiveness, lower pulmonary function, worse asthma control and steroid resistance.[3]

Vitamin-D-deficient patients have decreased chemotactic and phagocytic activity of macrophages. Levels lower than 30 ng/mL have been associated with a higher incidence of tuberculosis. Ecological studies have suggested that an environmental factor such as vitamin D could explain the seasonality of influenza. This can be reversed by supplementation with vitamin D. Furthermore, vitamin D inhibits the expression of inflammatory cytokines in monocytes, including IL-1, IL-6, tumour necrosis factor-alpha (TNF- α), IL-8, and IL-12. inhibits proliferation of Th lymphocytes. It also suppresses Th2 differentiation through IL-4 and IL-13 suppression. The production of IL-17 has been reported to be inhibited by vitamin D as well. The overall effect though, seems to be a shift in the expression of cytokines from a Th1 response towards a Th2 type response.

There is relatively little evidence about the effect of vitamin D on ILC2s and eosinophils. Vitamin D can be able to enhance eosinophil viability with reduced production of proinflammatory necrotic granules. Vitamin D, however, enhances antimicrobial immune responses through many mechanisms. It enhances cellular production of antimicrobial peptides and autophagy, which are important in response to both bacterial and viral infections thereby reducing the number of infective exacerbations of these patients.

Vitamin D3 has also been reported useful in glucocorticoid resistant bronchial asthma by overcoming ligand-induced down regulation of glucocorticoid receptors. Patients with higher levels of vitamin D was seen to have higher values of FEV1 and was also associated with reduced airway hyper responsiveness and was seen to improve with glucocorticoids better than those with low vitamin D levels.

Over the past few years, several RCTs of vitamin D therapies to improve asthma control have been completed and their findings published. Many of these shows positive correlation of poor asthma control and asthma severity with lower vitamin D levels. Our study aimed at determining level of vitamin D in asthmatic patients and assessed the improvement in severity of asthma after supplementation of Vitamin D in deficient patients in terms of lung function test and ACT scoring.

MATERIALS AND METHODS:

This was a cross-sectional study conducted in Department of pulmonary medicine at a tertiary care hospital after approval from the ethics committee. All were adults of 18 years and above. 55 patients of either gender who were already diagnosed to have bronchial asthma and following up on OP basis and optimised on treatment were included in our study after informed consent. They underwent the ACT scoring (table 1) and pulmonary function tests.

Table 1: Gender Distribution of Study Population

Gender distribution	Number of patients	Percentage (%)
Males	21	39.6
Females	32	60.4
Total	53	100

Inclusion Criteria

1.Diagnosed cases of bronchial asthma on treatment.
2.No history of exacerbations in last 2 months
3.No history of change in asthma medications in last 2 months
4.Patients who were 18 years and above.

Exclusion Criteria

1.Patients with other respiratory co morbidities
2.Patients who did not consent for the study
3.Patients less than 18 years
4.Patients with other systemic co morbidities like Diabetes Mellitus, Hypertension, thyroid disorder.
5.Patients already on vitamin D supplementation
6.Patients unable to perform spirometry
Patients who fit into these criteria were selected and informed about the study.

Patients who were Vitamin D deficient were supplemented with oral Vitamin D_3 6000 IU /day for 8 weeks as per guidelines of Endocrine Society for treatment of Vitamin D deficiency. All patients continued their regular asthma medications without any change.

RESULTS:

2 patients did not report for follow up. 53 patients who completed the study period were reassessed at the end of 8 weeks. History regarding symptoms were taken and patients were examined. Asthma control test score noted, and pulmonary function test was done. FEV1,FVC, FEV1/FVC and PEF were noted.

Out of 53 patients included in the study, 21 (39.6%) were males and 32 (60.4%) were Females (table 2).

Table 2: Vitamin D Levels Of Study Population

Vitamin D levels	Frequency	Percentage (%)
Deficiency	38	71.7
Insufficiency	11	20.7
Normal	4	7.6

The mean age of study population was 37.40 years ± 16.29 years. Majority of study population belonged to the age group 21- 30 years (15 patients).

The mean vitamin D level of study population was 17.22 ± 7.12 In the study population (table 3), out of 38 vitamin D deficient patients, 14 were males (26.4 %) and 24 were females (45.3 %). In vitamin D insufficiency group, there were 6 males (11.3%) and 11 females (9.4%). 1 male (1.9%) and 3 females (5.7%) had normal Vitamin D levels (figure 1).

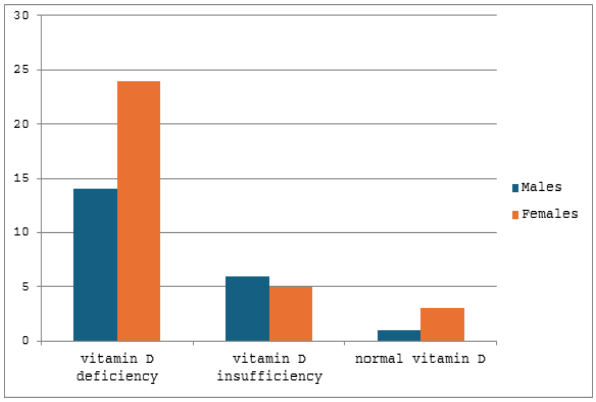

Figure 1: Gender Distribution Of Vitamin D Levels

Table 3: Association Between Vitamin D Levels and FEV1 By ANOVA

Vitamin D levels	Frequency	Mean FEV1	Std. Deviation	p value
<20	38	59.58	16.401	0.841
21-29	11	62.82	17.052	
≥30	4	62.25	26.323	
Total	53	60.45	17.009	

Most of the patients with vitamin D deficiency and vitamin D insufficiency were in 21 -30 age group.

No significant association between vitamin D levels and FEV1 was seen (table 4).

Table 4: Mean Difference Between Fev1 Levels Before And After Supplementation Of Vitamin D

Variable	Frequency	Mean FEV1	Standard deviation	Mean difference	p value
Pretest	38	59.58	16.4	7.632	<0.05*
Post-test	38	67.21	16.9		

Mean difference between FEV1 of vitamin D deficient patients before and after supplementation was 7.63 ($p<0.05$) which is statistically significant. In terms of FEV1 vitamin D deficient patients benefitted with supplementation (table 5).

Table 5: Mean Difference Between ACT Scores Before and After Supplementation Of Vitamin D

Variable	Frequency	Mean ACT score	Standard deviation	Mean difference	p value
Pretest	38	18.76	1.42	2.40	<0.05*
Post-test	38	21.16	1.55		

This table showed that ACT score improved significantly among asthma patients who were Vitamin D deficient after supplementation of the same (table 6).

DISCUSSION:

55 Bronchial asthma patients who met the inclusion criteria were enrolled into our study. Out of them, 53 patients completed the study period.

There were 21 males (39 .6%) and 32 females (60.4%) in our study. A similar study conducted by Paolo Solidoro et al[4] from Italy to assess severity of asthma in vitamin D deficient patients also had a female preponderance among asthmatic patients enrolled in their study(79 % females and 21 % males). Female gender has consistently been associated with higher prevalence of asthma in adults.

Although asthma can affect any age group, children and middle-aged population are more commonly affected. Our study showed mean age of 37.40 years with maximum number of patients in 21-30 age group (15 patients).

Studies have shown higher prevalence of vitamin D deficiency among bronchial asthma patients. 71 .7 % (38 patients) in our study population had vitamin D levels ≤ 20 ng/ml while 20.7 % patients (11 patients) had vitamin D levels between 21 to 30 ng /ml. Only 7.6 % (4 patients) had normal vitamin D levels.

Also Shaaban and Hashem[5] investigated serum vitamin D levels in 75 adults with asthma and 75 adult healthy controls and observed vitamin D deficiency in 78.66% asthmatic patients whereas 85% of healthy control subjects expressed sufficient levels.

Severity of asthma is assessed by symptoms and FEV1 values. In order to find the association of severity of asthma with vitamin D levels statistical evaluation of asthma severity was done using their ACT score and FEV1 values prior to vitamin D supplementation.

In our study mean FEV1 of vitamin D deficient patients were

59.58 ± 16.401 and insufficiency patients were 62.82 ±17.052. Patients with normal vitamin D level had mean FEV1 0f 60.45±17.009 .We did a Analysis of variance study (ANOVA) to find any association between serum vitamin D level and FEV1. Most of the recent studies show significant association between serum vitamin D levels and FEV1 value. However, our study showed no significant association between the two. This may be because of the small sample size along with significant difference in number of patients with normal and sub normal vitamin D levels. Out of 53 patients in our study, only 4 patients had normal vitamin D levels.

Mean FEV1 of vitamin D deficient patients before supplementation was 59.58 and after supplementation was 67.21. p value was calculated using paired t test which showed significant improvement in FEV1 after supplementation in Vitamin D deficient patients.

Study conducted by Paolo solidoro et al.[4] showed a mean FEV1 of 70 in vitamin D deficient asthmatics which improved to 80 after supplementation which is in par with our study which showed significant improvement in FEV1 of vitamin D deficient asthmatics after supplementation.

Arshi et al [6] enrolled 130 patients with moderate persistent asthma in an open label randomized controlled trial (RCT) and they found that vitamin D supplementation significantly improved forced expiratory volume in 1 s (FEV_1) and ratio of FEV_1 to forced vital capacity.

Our study showed mean ACT score of vitamin D deficient asthmatics as 18.76 ± 1.42 pre supplementation and 21.16 ± 1.55 as post supplementation. Paired t test showed a p value <0.05 i.e. ACT score improved significantly among asthmatic vitamin D deficient patients after supplementation.

Study by Menon et al. [7] evaluated ACT score of asthmatic patients to assess the role of vitamin D in asthma control and severity and found that those with lower vitamin D levels had lower ACT scores and vitamin D supplementation resulted in significant improvement in ACT scores. This study had a control group and all subjects in test group were supplemented with vitamin D unlike in our study where we did not have a control group and only vitamin D deficient patients were supplemented.

CONCLUSION:

From the study entitled "Study of vitamin D levels in patients with Bronchial asthma" we have the following conclusion

- Asthma is commonly seen in the younger age group
- Females are commonly affected by Asthma
- Most of the asthmatics have lower vitamin D levels.
- Vitamin D levels are lower in females as compared to males.
- Supplementation of vitamin D in deficient asthmatics is beneficial in terms of FEV1 and ACT score during the course of their treatment.

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