

Evaluation of Pulmonary Function in Asthmatics Receiving Vitamin D3 Supplementation: A Prospective Study at a Tertiary Care Hospital

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ABSTRACT

Background: Asthma is a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyperresponsiveness, and an underlying inflammation. Vitamin D is required to maintain the serum calcium concentration within the normal physiologic range for musculoskeletal health. Hence, the present study was conducted for assessing the pulmonary function in asthma patients receiving a vitamin D3 supplementation.

Materials & methods: A total of 50 asthma patients. Complete demographic and clinical details of all the patients were obtained. Vitamin D3 supplementation was done in all the patients after assessment of serum vitamin D levels. Pulmonary functions were evaluated at baseline and at follow-up after starting of vitamin D3 supplementation. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

Results: A total of 50 patients were enrolled. The mean age of the patients was 45.8 years. Out of 50 patients, 35 patients were males while the remaining were females. 70 percent of the patients were of urban residence while the remaining were of rural residence. Mean FVC, FEV1 and FEV1/FVE at baseline was 78.32%, 70.16% and 75.13% respectively. At 3 months follow-up after starting of vitamin D3 supplementation, mean FVC, FEV1 and FEV1/FVE at baseline was 82.46%, 75.28% and 80.16% respectively. Significant improvement of pulmonary functions was seen among asthma patients on vitamin D3 supplemental therapy.

Conclusion: From the above results, the authors conclude that vitamin D3 supplementation significantly improves asthma symptoms.

KEYWORDS: Asthma, Vitamin D3.

INTRODUCTION

Asthma is a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyperresponsiveness, and an underlying inflammation. The interaction of these features of asthma determines the clinical manifestations and severity of asthma and the response to treatment.^{1, 2} The concepts underlying asthma pathogenesis have evolved dramatically in the past 25 years and are still undergoing evaluation as various phenotypes of this disease are defined and greater insight links clinical features of asthma with genetic patterns. Central to the various phenotypic patterns of asthma is the presence of underlying airway

inflammation, which is variable and has distinct but overlapping patterns that reflect different aspects of the disease, such as intermittent versus persistent or acute versus chronic manifestations. Acute symptoms of asthma usually arise from bronchospasm and require and respond to bronchodilator therapy. Acute and chronic inflammation can affect not only the airway caliber and airflow but also underlying bronchial hyperresponsiveness, which enhances susceptibility to bronchospasm.³⁻⁵

Hence; the present study was conducted for assessing the pulmonary function in asthma patients receiving a vitamin D3 supplementation.

MATERIALS & METHODS

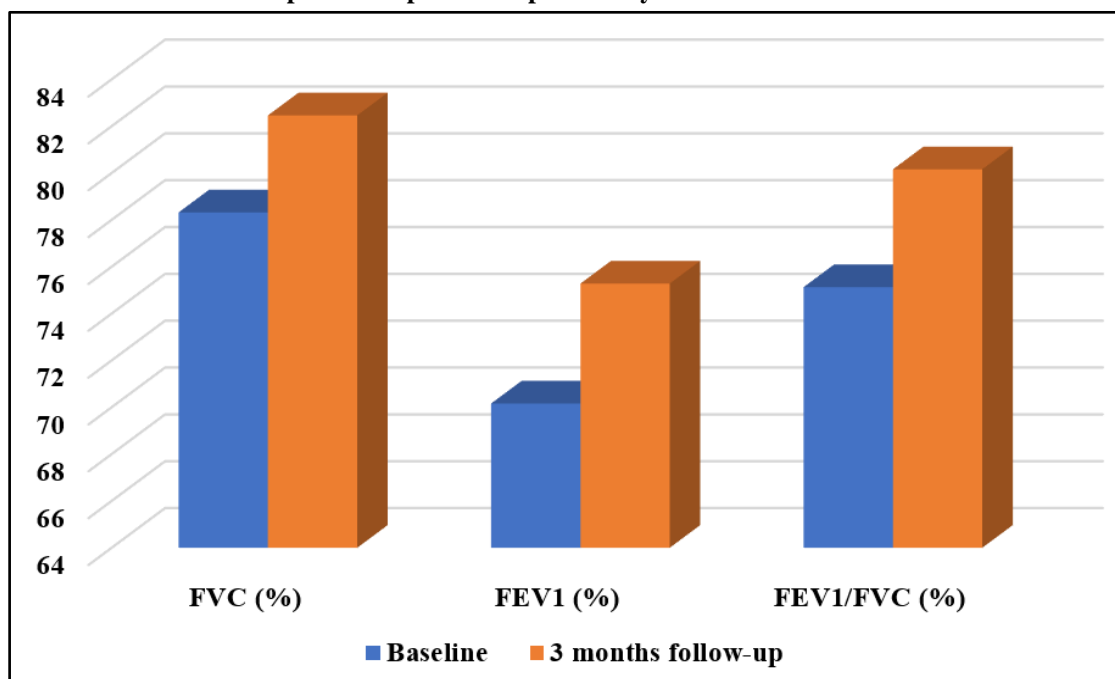
The present study was conducted for assessing the pulmonary function in asthma patients receiving a vitamin D3 supplementation. A total of 50 asthma patients. Complete demographic and clinical details of all the patients were obtained. Vitamin D3 supplementation was done in all the patients after assessment of serum vitamin D levels. Pulmonary

functions were evaluated at baseline and at follow-up after starting of vitamin D3 supplementation. Patients with history of any other systemic illness or any known drug allergy were excluded from the present study. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Student t test was used for evaluation of level of significance.

Table 1: Comparison of pulmonary functions at baseline

Pulmonary functions	Baseline	3 months follow-up	p-value
FVC (%)	78.32	82.46	0.001 (Significant)
FEV1 (%)	70.16	75.28	0.000 (Significant)
FEV1/FVC (%)	75.13	80.16	0.003 (Significant)

Graph 1: Comparison of pulmonary functions at baseline



RESULTS

A total of 50 patients were enrolled. The mean age of the patients was 45.8 years. Out of 50 patients, 35 patients were males while the remaining were females. 70 percent of the patients were of urban residence while the remaining were of rural residence. Mean FVC, FEV1 and FEV1/FVE at baseline was 78.32%, 70.16% and 75.13% respectively. At 3 months follow-up after starting of vitamin D3 supplementation, mean FVC, FEV1 and FEV1/FVE at baseline was 82.46%, 75.28% and 80.16% respectively. Significant improvement of pulmonary functions was seen among asthma patients on vitamin D3 supplemental therapy.

DISCUSSION

Asthma is one of the most common chronic conditions affecting both children and adults, yet much remains to

be learned of its etiology. Although genetic predisposition is clearly evident, gene-by-environment interaction probably explains much of the international variation in prevalence rates for allergy and asthma. Environmental factors such as infections and exposure to endotoxins may be protective or may act as risk factors, depending in part on the timing of exposure in infancy and childhood. Some prenatal risk factors, including maternal smoking, have been firmly established, but diet and nutrition, stress, use of antibiotics and mode of delivery may also affect the early development of allergy and asthma. Later in childhood, putative risk factors include exposure to allergens, breastfeeding (which may initially protect and then increase the risk of sensitization), family size and structure, and sex and gender.^{6, 7} The resulting airflow obstruction may be chronic or episodic, with respiratory symptoms resolving

either spontaneously or as a result of therapy (bronchodilators or corticosteroids). A generally accepted definition of asthma does not yet exist because the syndrome has different causes, mechanisms, clinical features, and responses to therapy. Vitamin D insufficiency affects almost 50% of the population worldwide. An estimated 1 billion people worldwide, across all ethnicities and age groups, have a vitamin D deficiency (VDD). This pandemic of hypovitaminosis D can mainly be attributed to lifestyle (for example, reduced outdoor activities) and environmental (for example, air pollution) factors that reduce exposure to sunlight, which is required for ultraviolet-B (UVB)-induced vitamin D production in the skin.^{8,9} Hence; the present study was conducted for assessing the pulmonary function in asthma patients receiving a vitamin D3 supplementation.

A total of 50 patients were enrolled. The mean age of the patients was 45.8 years. Out of 50 patients, 35 patients were males while the remaining were females. 70 percent of the patients were of urban residence while the remaining were of rural residence. Mean FVC, FEV1 and FEV1/FVE at baseline was 78.32%, 70.16% and 75.13% respectively. At 3 months follow-up after starting of vitamin D3 supplementation, mean FVC, FEV1 and FEV1/FVE at baseline was 82.46%, 75.28% and 80.16% respectively. Significant improvement of pulmonary functions was seen among asthma patients on vitamin D3 supplemental therapy. A connection between VitD status and asthma has been considered since many years. VitD deficiency has been blamed as one cause of increased asthma prevalence in the last decades. VDR variants were found to be associated with asthma in patient cohorts. A recent clinical investigation showed that high VitD levels are associated with better lung function, less airway hyperresponsiveness and improved glucocorticoid response. A population-based study suggested that lower VitD levels are associated with increased requirements for inhaled corticosteroids in children. Vitamin D insufficiency is common in this children with mild-to-moderate persistent asthma and is associated with higher odds of severe exacerbation. Epidemiologic studies have also shown that maternal VitD intake during pregnancy protects from wheezing in childhood. In contrast, also data exist that children whose mothers had high Vit D levels in pregnancy had an increased risk of eczema and asthma, suggesting that the time point of Vit D supplementation seems to determine the susceptibility to atopic disease. On the experimental level in a murine asthma model, the VDR is necessary for the development of an allergic airway inflammation.¹⁰⁻¹⁷

Balakrishnan Menon et al evaluated Vitamin D levels in asthma and the effect of Vitamin D supplementation on severity and control of asthma. The mean Vitamin D in study group was 18.16 ± 5.32 ng/ml which improved to

27.16 ± 7.61 ng/ml after supplementation. The value in control group was 18.79 ± 6.07 at the start and 19.14 ± 5.81 at end of study. The difference was highly significant ($p < 0.01$). The mean ACT score in study group was 16.62 ± 3.18 which improved to 22.08 ± 1.17 after treatment. The difference was highly significant ($p < 0.001$). In the control group it was 17.57 ± 6.86 at the start and 19.78 ± 2.39 at the end of study ($p < 0.05$). Those with lower vitamin D levels had lower ACT scores and vitamin D supplementation resulted in significant improvement in ACT scores ($p < 0.05$). Vitamin D levels were low in patients with asthma. There was highly significant improvement in asthma control and severity after supplementation with Vitamin D.¹⁸

CONCLUSION

From the above results, the authors conclude that vitamin D3 supplementation significantly improves asthma symptoms.

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