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RESEARCH ARTICLE

ASSOCIATION OF VITAMIN D LEVELS WITH SEVERITY OF PAEDIATRIC ASTHMA

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ABSTRACT:

INTRODUCTION: Vitamin D deficiency has shown to be associated with increased severity, and impaired pulmonary function in asthmatic patients. This study evaluates the relationship between vitamin D status and asthma control in children. **Methods:** Serum 25-hydroxyvitamin D and pulmonary function tests were done for the children included in the study.**Results:** A total of 67 asthmatic children were included in our study, out of which 37 were boys, and 30 were girls. Their mean age±SD was 10.6±3.0 years. Vitamin D statuses were: deficiency (<20 ng/mL) in 19% of the patients, insufficiency (20-30 ng/mL) in 44.6%, and sufficiency (>30 ng/mL) in 36.4%. The vitamin D levels were 25.4±9.4 ng/mL in uncontrolled patients, 29.6±8.6 ng/mL in partly controlled patients, and 27.3±8.0 ng/mL in controlled patients (*P*>0.05). There were no significant differences of vitamin D status in pulmonary function, asthma exacerbation, inhaled-corticosteroid dose, anti-inflammatory drugs, or hospitalization. Vitamin D deficiency patients had delayed onset of asthma than insufficiency or sufficiency patients. No significant correlation between serum vitamin D and pulmonary function test or doses of Inhaled-corticosteroid. **Conclusions:** The prevalence of vitamin D deficiency in asthmatic children in Bangalore was high, and there is no significant relationship between vitamin D status with severity of asthma.

Key words: Asthma, Vitamin D

INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation is associated with hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness and chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction within the lung that is often reversible either spontaneously or with treatment. (GINA 2011)(1) The incidence of asthma in Asian countries varies between 5.2% in Taipei to 30% in New Zealand and 10 to 17% in other countries. In Bangalore, asthma increase from 9% in 1979 to 29.5% in last 20 years.74% of asthma attacks experienced in children less than 5 years of age and 26% in less than 1 year of age. Male to female ratio is 2:1. (2). Rise in prevalence over time in Bangalore had been associated with environmental pollution, urbanization, and change in the demography of the city.

Vitamin D is necessary to appreciate metabolic bone disease and rickets. Serum 1,25(OH)2 D levels are higher in children than in adults, not subjective to seasonal variability, and peak in the 1st year of life and again during the adolescent growth spurt.(3)

Vitamin D deficiency is one of the factors associated with asthma epidemics and has been recently proposed (4).

Vitamin D is important for calcium and bone metabolism and immunomodulation. There is higher prevalence of decreased vitamin D levels in asthmatics among adults and children. . Gene and environment interactions explain the reason for different asthma prevalence in different parts of world (5). In adolescents, young adults and elderly populations the problems of vitamin D deficiency all over the world is increasing (6).

Higher severity of asthma and impaired pulmonary function is associated with low vitamin D levels (7). Vitamin D supplementation will increase the response to glucocorticoid in asthmatic patients (8). Vitamin D deficiency in patients has shown increased airway hyper-responsiveness and also corticosteroid requirement is increased (9).

This study is a comparison of vitamin D status between controlled, partially controlled and uncontrolled asthmatic patients and also to examine the correlation between vitamin D levels and corticosteroid requirements or pulmonary function.

MATERIALS AND METHODS:

A prospective study was conducted at Rajarajeshwari medical college, Bangalore. Informed consent was given by the patient and also parent. Children who were diagnosed asthma among the age group of 6-16 years were enrolled between January 2014 to june 2015. Dietary history, adequacy of sun exposure for >15 mins/day, outdoor exercise for hours/week, clinical variable factors of asthma results were recorded. Dietary vitamin D was assessed by intake of egg yolk, mushrooms, and oily fish as times/week. Children with liver, endocrine or kidney diseases which might affect vitamin D levels, patients who took vitamin D supplementation were excluded from the study.

By Global Institute for Asthma (GINA) guidelines, participant's history of asthma and level of asthma control were assessed.

Serum calcium, creatinine, phosphorous and aspartate transaminase (AST), alaninine transaminase (ALT) liver enzymes were measured for each patient using modular P800 analyser E. Serum parathyroid harmone (PTH) and Serum 25-OH Vitamin D measured by immunoassay was reported in nanograms/ml. vitamin D levels were categorized as deficiency <20 ng/ml. and insufficiency 20-30 ng/ml.

Eosinophil counts were also considered. Pulmonary function test was performed using spirometer.

STATISTICAL ANALYSIS:

Using descriptive statistic mean, median, range, frequency, SD; the demographic and clinical data of the patients were expressed. 3 groups of the level of asthma control of different characteristics were assessed by kruskalwallis test for non parametric data. Analysis of variance (ANOVA) for parametric data and Chi square test for descriptive analysis was used.

After the correction of confounders like sex and age, the degree of associations between Vitamin D levels and doses of inhaled corticosteroids as well as pulmonary function were estimated using partial linear correlation.

A P value of<0.05 was considered statistically significant.

RESULTS:

A total of 67 asthmatic patients with a mean +/- SD age of 10.6+/- 3 years were considered in this study. Out of which 37 were males and 30 were females.

According to GINA classification, proportion of patients with different levels of asthma control were 25.4% uncontrolled patients, 36.4% partly controlled patients and 38.2% for controlled patients. The proportion of vitamin D deficiency was higher in uncontrolled asthmatic patients 31.4% than in partly controlled 17.2% and controlled patients 12.6%. This difference was however not statistically significant.

Uncontrolled group used more of short acting Beta 2 agonists (SABA) and systemic corticosteroids than the other groups ($p<0.05$). Higher doses of inhaled corticosteroids is also used by uncontrolled and partly controlled groups; used more in hospitalization.

Pulmonary function test: There is no significant difference, as the uncontrolled and partly controlled groups received bronchodilator; there was a higher percentage change of FEV1 than the controlled group.

The proportion of onset of asthma, family history of asthma, eosinophil count, environmental factors were not significantly different between uncontrolled, controlled and partially controlled groups.

Mean serum vitamin D levels in controlled, partially controlled and uncontrolled were 27.3 +/- 8 ng/ml, 29.6 +/- 8.6 ng/ml, 25.4 +/- 9.4 ng/ml respectively. No significant difference between 3 groups. The plasma levels of phosphorous, creatinine, calcium, AST, ALT were in normal range.

Vitamin D deficiency patients spent few hours on exercise compared to the other 2 groups, which was statistically not significant.

There were 13 vitamin D deficiency children, 30 vitamin D insufficiency and 24 with vitamin D sufficiency. The vitamin D deficiency patients had higher PTH levels than the other 2 groups.

DISCUSSION:

Based on GINA classification, level of asthma control was classified. Percentage of emergency department visits, hospitalization, % change in FEV1 and systemic corticosteroid usage were higher in uncontrolled group compared to other 2 groups.

No significant difference in serum vitamin D levels in this study, between the levels of asthma control. In this study, a positive correlation was found between vitamin D levels and control of asthma symptoms (10). However, higher prevalence of vitamin D deficiency/ insufficiency were found in asthmatic patients; and lower prevalence of vitamin D deficiency and insufficiency were found in our study, which explains different results.

About 64% of asthmatic children in this study had vitamin D insufficiency/deficiency. Serum PTH levels were higher in vitamin D deficiency patients, supporting compensatory mechanism of body in maintaining normal calcium levels.

This study could not find correlation between PFT, severity of asthma and Serum vitamin D levels, supported by study of Devereux et al (11). And also no correlation between eosinophil count, Ig E and Serum vitamin D levels.

Some studies show that low vitamin D levels associated with pulmonary function, emergency department visits, use of bronchodilators, hospitalization, ICS doses and anti-infalammatory drugs Searing et al (10, 11,12,13). In our study, there is no correlation between serum vitamin D levels and use of ICS, use of LABA and eosinophil counts.

Since this is a prospective study, long term follow up study is needed focusing on changes in vitamin D status and other asthma parameters to clarify the effect of vitamin D status on asthma. Also the vitamin D levels and asthma severity is also affected by confounding factors. The genotype and phenotype of asthmatic patients play a significant role in association between Serum vitamin D and asthma severity.

In total our study suggests no significant correlation between vitamin D levels and asthma control status on asthma. More studies are required to determine the promising role of vitamin D supplements in asthmatic patients

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