

Original Research Article

Vitamin D3 levels in allergic rhinitis: a case control study from South Karnataka

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ABSTRACT

Background: Allergic rhinitis (AR) is a common disorder seen in routine otolaryngology practice. There has been an increased interest in researchers worldwide regarding role of vitamin D3 in pathogenesis of allergy. This study intends to compare levels of vitamin D3 in patients with clinically diagnosed allergic rhinitis and subjects without allergic rhinitis. This study was conducted in rural South Karnataka where incidence of allergic rhinitis is on the rise. Main objective of this study was to assess vitamin D3 levels in patients with clinically diagnosed AR and compare it with vitamin D3 levels in control group where normal subjects were included.

Methods: Total of 100 patients were included in this study. Case group comprised of 50 patients clinically diagnosed as AR and control group comprised 50 subjects without any symptoms of AR. All the patients underwent serum vitamin D3 estimation. Other parameters such as age, gender, occupation (outdoor vs indoor) and region of residence (urban vs rural) were also compared between the groups.

Results: This study did not find significant difference between two groups when all the parameters compared. Significant number of study subjects both in case and control group were found to be either deficient or inadequate in vitamin D3 levels.

Conclusions: we did not find significant difference in vitamin D3 levels between cases and controls. Further studies with bigger sample size and robust study design may throw more light on association of vitamin D3 with AR.

Keywords: Vitamin D3, Allergic rhinitis, South Karnataka

INTRODUCTION

Allergic rhinitis (AR) is a commonest type of non-infective rhinitis encountered in day to day otolaryngology practice. There is significant disease burden worldwide due to this condition. Most common symptoms of this condition include sneezing, rhinorrhea, nasal obstruction, itching and sometimes anosmia. AR negatively affects quality of life of the patient. It can impact school attendance, workplace performance and social life.¹ Allergic rhinitis is an IgE mediated immune response which occurs when nasal mucosa is exposed to

the allergen.¹ Etiology of allergy is still an area of active research and there are ongoing trials which are trying to identify exact etiology of various types of allergy. Recently vitamin D3 is being studied extensively and found to be one of the causes for food allergy, asthma and eczema.²⁻⁴ Role of vitamin D3 in AR seems to be as a disease modifying factor rather than disease causing factor.⁵ It is already known that vitamin D3 influences activity of B cells, T cells, macrophages and monocytes. Vitamin D3 seems to be having profound impact on innate and adaptive immunity. It also modulates immunity by influencing the activity of various cytokines

and immunoglobulins, which mediate allergic disorders.⁶ These properties of vitamin D3 has attracted many researchers to understand role of vitamin D3 in allergy and allergic rhinitis and impact of vitamin D3 supplementation on disease process of allergic rhinitis. The community-based Indian studies of the past decade done on apparently healthy controls reported a prevalence ranging from 50% to 94%.⁷⁻¹⁰ So, author decided to conduct a case control trial evaluating vitamin D3 levels in allergic rhinitis patients and patients without signs and symptoms of allergic rhinitis.

Aims and objectives

This study was conducted in rural South Karnataka where incidence of allergic rhinitis is on the rise. Main objective of this study was to assess vitamin D3 levels in patients with clinically diagnosed AR and compare it with vitamin D3 levels in control group where normal subjects were included.

METHODS

Study design

This was a case control study was involving total of 50 patients each in case and control group.

Place of study

Tertiary care teaching hospital situated in rural South Karnataka.

Period of study

Duration of study was 12 months (December 2018 to November 2019).

Inclusion criteria

Clinically diagnosed cases of allergic rhinitis according to criteria of AR and its impact on asthma (ARIA), ages between 18 to 70 years and patients who have not taken vitamin D supplements in last 2 years were included.

Exclusion criteria

Patients aged less than 18 years and more than 70 years, patients taking/taken any form of vitamin D supplements in past two years and patients with non-allergic rhinitis were excluded.

Total of 50 patients with allergic rhinitis were included in this study and were labelled as ‘cases’. Similarly, 50 healthy individuals were selected and are labelled as ‘controls’. Serum vitamin D3 levels were ordered for all the individuals selected for this study. Written informed consent was taken from all the study participants. The AR patients were clinically diagnosed according to the

criteria of allergic rhinitis and its impact on asthma (ARIA).¹¹

Apart from serum vitamin D3 levels other demographic variables such as age, gender, socio economic status, region of residence, type of work (indoor/outdoor) were also recorded.

Patients weight and height were also recorded for the purpose of calculating body mass index (BMI).

Serum 25-hydroxyvitamin D (25(OH)D) was measured to determine vitamin D3 deficiency. 25(OH)D <20 ng/ml were taken as vitamin D deficiency, 20-30 ng/ml indicated vitamin D insufficiency, and 25(OH)D >50 ng/ml showed optimal levels.¹²

For biostatistical analysis, SOFA statistics software was utilized. For continuous variables, mean and standard deviation (SD) were calculated and the independent T-test was used for comparison. For stratified variables, frequencies and percentages were calculated and chi-square was used for comparison. A p value of ≤0.05 was considered statistically significant.

RESULTS

Our study comprised of total of 100 participants, 50 cases and 50 controls. 37 (72%) study subjects were between age group 18 to 50 in case group, whereas 35 (70%) subjects of control group were in this age group. Study population had slightly greater number of female subjects both in case and control group. Higher number of subjects belonging to rural areas and working outdoor was observed both in case and control groups. When comparison was made regarding age, gender, residence and occupation between case and controls, statistically there was no significant difference (Table 1).

Table 1: Results of the study.

Parameters	Case (n=50)	Control (n=50)	P value
Age (in years)			
18-50	37	35	0.58
>50	13	15	
Gender			
Male	21	23	0.30
Female	29	27	
Region of residence			
Urban	13	10	0.48
Rural	37	40	
Occupation			
Indoor	12	15	
Outdoor	38	35	
Serum 25-hydroxyvitamin D, ng/ml			
Adequate (>50)	8	16	0.09
Inadequate (20-30)	14	22	
Deficient (<20)	28	12	

When vitamin D3 levels between both the study groups was studied, it was seen that patients of AR group had mean serum vitamin D levels of 15.8 ± 7.4 ng/ml as compared to 18.1 ± 6.6 ng/ml in subjects without AR. The differences were statistically significant ($p=0.003$). In fact, subjects in both the study groups had either inadequate or deficient levels of vitamin D3. But when further stratification of vitamin D levels into adequate, inadequate and deficient was made and each subgroup was compared between cases and controls, it found to be statistically not significant ($p=0.09$).

DISCUSSION

The hormonal form of vitamin D3 has been recognized as an immunoregulatory hormone for 30 years.¹³ Experimental studies have demonstrated that 1,25(OH)2D3 affects a wide range of immune cells and cytokines and is associated with many immune diseases. Many previous studies have shown that T cells, B cells, dendritic cells (DCs), monocytes, and macrophages are all influenced by the regulation Vitamin D3.^{14,15} Vitamin D3 inhibits T-cell proliferation; facilitates induction of Foxp3+ T regulatory (Treg) cells; suppresses the differentiation, maintenance, bioactivity, and transcription of Th17 cells; and induces the switch from Th1 to Th2 by decreasing the Th1 response via regulation of antigen presenting cells and enhancing Th2 cell development.¹⁶⁻²⁰ An increasing number of epidemiological studies have linked vitamin D levels with allergic disorders, especially asthma. Given the important role of vitamin D3 in the immune system, the potential relationship between vitamin D and AR has received much interest in recent years. It is generally agreed that a shift from a Th1 to Th2 phenotype in the proliferation of CD4+ T cells contributes to the pathogenesis of AR though exact mechanism is not clear.

In a study conducted by Wjst et al analysis of vitamin D levels in patients with diagnosed AR was done.²¹ They found a positive association. Similar study known as Third National Health and Nutrition Examination Survey III study in Germany found that AR prevalence increased with levels of 25(OH)D3 in all subgroups. There are few studies which contradict the outcome of above studies. Studies conducted by Dogru et al and Bener et al didn't show positive correlation between levels of vitamin D3 and AR. Apart from observational studies there are few interventional studies which analyzed the alleviation of symptoms of AR after vitamin D supplementation.^{22,23} Studies by Heine et al and Jerzynska et al found significant reduction in symptoms of AR and immune modulation after vitamin D3 supplementation.^{24,25}

Our study does not show significant difference between vitamin D3 levels in patients with AR when compared with control group, though significant difference is observed before stratification of vitamin D3 levels into further subgroups.

Our study has certain limitations. Study sample is small. Most of the subjects included in the study worked outdoors which probably is the reason for higher level of vitamin D3 levels in both the study groups compared to population which mostly works indoors. Also, our study did not include other parameters to assess allergy such as IgE and eosinophil counts.

CONCLUSION

Our study does not show significant relation between vitamin D3 levels and AR. Very weak relation between AR and vitamin D3 levels were found when vitamin D3 levels are stratified into adequate, inadequate and deficient. Further studies with robust randomization and blinding including larger population and addition of more allergy parameters will confirm or reject our findings. Since there has been a widespread interest worldwide regarding association of vitamin D3 with immune function, further studies are necessary to identify its exact relation with AR.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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