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A STUDY ON ASSESSING THE LEVELS OF IGE AND QUALITY OF LIFE IN ALLERGIC RHINITIS PATIENTS AFTER ADMINISTRATION OF VITAMIN D AS AN ADJUVANT THERAPY

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Abstract

Allergic rhinitis (AR) is a prevalent condition often associated with vitamin D deficiency, with implications for disease severity and management. This randomized controlled trial investigated the efficacy of vitamin D supplementation as an adjuvant therapy in AR patients, assessing symptom improvement and changes in serum IgE levels. The study enrolled 93 AR patients, with 50 demonstrating vitamin D deficiency. Patients were divided into two groups: Group A received intranasal steroid spray alone, while Group B received both intranasal steroid spray and oral vitamin D supplementation. Significant reductions in total nasal symptom scores (TNSS) were observed in both groups post-treatment, with Group B showing greater improvement. Moreover, more severe vitamin D deficiency correlated with increased AR severity. However, there was no significant change in serum IgE levels post-vitamin D supplementation. This study highlights the potential role of vitamin D supplementation in AR management and underscores the need for further research to elucidate its therapeutic implications.

Keywords: Allergic Rhinitis, Vitamin D Supplementation, Total Nasal Symptom Score, Serum IgE Levels.

INTRODUCTION

Allergic rhinitis and asthma frequently coexist, with approximately 85% of asthmatic patients also experiencing allergic rhinitis, and about 40% of allergic rhinitis patients developing or having asthma (1,2). Treatment options for these conditions include various drugs such as antihistamines, intranasal corticosteroids, decongestants, and, more recently, immunotherapy.

The global increase in allergic diseases, particularly in developed nations, has been associated with low levels of vitamin D. The modern lifestyle, characterized by increased indoor time and reduced sun exposure, contributes to decreased cutaneous production of vitamin D. Although several studies have explored the role of vitamin D in the treatment of allergic diseases and asthma, the results remain controversial (3). In the present study, the effectiveness of vitamin D supplementation will be assessed in patients suffering from moderate to severe allergic rhinitis, encompassing both seasonal and perennial cases and assessing the levels of IgE before and after supplementation. This investigation aims to shed light on the potential impact of vitamin D in managing allergic rhinitis and contribute to the understanding of its role in the broader context of allergic diseases.

The prevalence of allergic rhinitis (AR) in India, as reported in community-based studies conducted over the past decade, has been found to range from 50% to 94% among apparently healthy individuals. These studies encompassed various age groups and demonstrated a high prevalence of AR throughout the country (4,5). The pathogenesis of AR involves a complex interplay of immune cells and signalling

pathways. While the shift from a Th1 to Th2 phenotype in CD4+ T cells has long been implicated in AR, recent research indicates the involvement of additional T cell subsets such as Th17 and regulatory T (Treg) cells. Vitamin D plays a crucial role in modulating the immune response associated with AR. It inhibits the proliferation of T cells, promotes the development of Th2 cells, facilitates the induction of Treg cells, and suppresses the differentiation and activity of Th17 cells. Additionally, vitamin D inhibits the proliferation of activated B cells and plasma cell differentiation, leading to decreased immunoglobulin secretion, including IgE(6,7), which is involved in allergic reactions.

Several studies have demonstrated a correlation between vitamin D deficiency and the classification of allergic rhinitis, with a significant proportion of AR patients exhibiting severe vitamin D deficiency (8). Moreover, supplementation with vitamin D in patients with allergic rhinitis has been shown to alter the natural course of the disease, leading to significant clinical improvement.

METHODOLOGY

This randomized controlled trial aimed to assess the efficacy of vitamin D supplementation as an adjuvant therapy in AR patients. A total of 93 AR patients were enrolled, with 50 exhibiting vitamin D deficiency. Patients were divided into two groups: Group A received intranasal steroid spray alone, while Group B received both intranasal steroid spray and oral vitamin D supplementation. Total nasal symptom scores (TNSS) were recorded pre- and post-treatment, along with serum IgE levels.

Inclusion criteria:

Patients with symptoms of allergic rhinitis.

Aged between 18 and 40 years.

Exclusion criteria:

Non allergic rhinitis.

Associated nasal co-morbidities may include conditions such as nasal polyposis, sinusitis, deviated nasal septum, and autoimmune diseases affecting the nose.

Associated Systemic comorbidities affecting vitamin D levels like Juvenile Idiopathic Arthritis, Rickets, Cystic Fibrosis, Ulcerative Colitis, Crohn’s disease, Celiac disease, Thyroid dysfunction.

Individuals who had received medications including corticosteroids, barbiturates, omega-3 and vitamin D.

Participants in the age range 18 to 40 years will be considered for enrolment in the study.

Include subjects diagnosed with allergic rhinitis

The treatment guidelines were established according to the ARIA 2017 recommendations (9). Patients in Group A were prescribed Fluticasone 50 mcg nasal spray, 2 puffs twice daily, for a duration of 4 weeks. Conversely, patients in Group B were prescribed Fluticasone 50 mcg nasal spray, 2 puffs twice daily, in addition to Oral Vitamin D3 Cholecalciferol 60000 IU once weekly for 4 weeks. Serum Vit D levels in the study population were recorded and tabulated. Post-treatment TNSS scores and

serum IgE levels were recorded in both groups. TNSS is the sum of scores for nasal congestion, sneezing, nasal itching, and rhinorrhoea at each time point, using a four-point scale (0–3). TNSS is calculated by adding the score for each of the symptoms to a total out of 12.

Statistical analysis:

The statistical analysis was carried out using SPSS software version 19. Quantitative measurements were summarized in terms of mean (standard deviation)/median (Inter quartile range) and qualitative variables were expressed as frequency(percentages). Shapiro wilk test was used to assess the normality, Wilcoxon signed rank test was used to check the changes in the TNSS score over the time period for both the groups. Independent t test and chi-square test were used to compare the differences between the two groups with respect to quantitative and qualitative measurements respectively. Also to compare the TNSS score at 4th week after adjusting for baseline TNSS score, ANCOVA was done. P-value <0.05 was considered as significant.

Sample size: 50, Group A - 25, Group B – 25.

Variables	Group A (n=25)	Group B (n=25)
TNSS score at baseline	10(10, 11.5)	10(9, 11)
TNSS score at 4th week	9(8, 10)	6(5, 7)
p value	<0.001	<0.001

RESULTS

In Present study, Vit D levels were however studied in all 93 patients who were diagnosed with allergic rhinitis.

Out of 93 patients 50 had Vitamin D deficiency.

Table 1: Severity of allergic rhinitis vs severity of vitamin D deficiency

Vitamin D Status	Number of Patients	Average TNSS Score
Severe Deficiency (<20 ng/ml)	22	11.2
Insufficient (20–29 ng/ml)	28	8.5
Sufficient (30–100 ng/ml)	43	5.2

Table 2: The statistical analysis showing the mean difference in TNSS score in both groups

Group	Mean Pre-Treatment TNSS Score	Mean Post-Treatment TNSS Score
A	10.60 ± 1.000	9.16 ± 1.434
B	9.96 ± 1.020	6.08 ± 1.187

Table 3: Wilcoxon signed rank test with median (Inter quartile range)

Variables	Group A (n=25)	Group B (n=25)	p- value
Age	29.12 ± 6.83	28.12 ± 6.1	0.58
Male	14(56%)	14(56%)	1.00
TNSS score at 4th week*	8.842 ± 0.885	6.398 ± 0.885	<0.001
* indicates the post treatment mean ± SD of TNSS score after adjusting for the covariate TNSS score at baseline			

In Present study, out of 93 patients enrolled male to female ratio was 0.77 (38 males vs. 55 females). Vit D levels were however studied in all 93 patients who were diagnosed with allergic rhinitis. Out of 93 patients 50 had Vitamin D deficiency, which

is 53.76%. Out of these 50; 22 patients had severe Vit D deficiency with average TNSS score as 11.2 while 28 patients had insufficient Vit D levels with average TNSS as 8.5.

Mean age of group A with standard deviation is 29.12 ± 6.83, while in group B 28.12 ± 6.1 with p value of 0.58, which is considered to be not significant. Both the groups have male predominance 56% with p value of 1.00.

The pre-treatment TNSS score in Group A (only fluticasone spay) was 10.60 ± 1.000 while post-treatment score was 9.16 ± 1.434 with $p<0.001$ (Table 3). The pre-treatment TNSS score in Group B (fluticasone spay with Vit D) was 9.96 ± 1.020 while post-treatment score was 6.08 ± 1.187 with $p<0.001$.

On comparing the mean TNSS score of group A with group B at 4^{th} week, p value is <0.001, which is significant.

Our trial efficacy of vitamin D supplementation in Allergic Rhinitis studied the effect of adding Vitamin D in management of moderate and severe allergic patients. It was found that adding Vitamin D to nasal steroid spray showed statistically significant improvement in post-treatment TNSS score than by not adding Vitamin D.

Another variable which was studied though it was not a primary outcome variable was to study for role of Vit D deficiency and its correlation with TNSS. It was found that more severe the Vit D deficiency more severe was the degree of allergic rhinitis (Table 1). Although technique of randomisation, data collection, careful selection of homogenous allergic rhinitis patients, study of parameters like TNSS score for evaluation of efficacy of treatment and correlation of severity of Vit D deficiency with severity of symptoms of allergic rhinitis, well accepted dose of Vit D and fluticasone, safety monitoring and appropriate management of non-responders were major strengths of trial, there were many limitations of current trial like small cohort, short follow up, selection of patients only with Vit D deficiency and not all allergic patients, concerns about internal validity, external validity and generalizability of results.

Another important observation was the association of vit-d deficiency with severity of allergic rhinitis patient. It was observed that 22 patients had severe Vit D deficiency (i.e. 20 ng/ml) and patients also had TNSS >10 which was on higher side taking the average TNSS in this group to 11.2 as compared to patients with moderate Vit D deficiency (i.e. 20–30 ng/ml); with average TNSS coming up to 8.5 (Table 1).

Another important observation was the association of IgE after vitamin D, the pre-treatment mean (standard deviation) total IgE level was 42.35(32.7) IU/ml, and post treatment IgE mean (standard deviation) serum IgE level was 41.53(34.5) IU/ml. There was no significant improvement in serum IgE levels after supplementation of Vitamin D in allergic rhinitis patients. So, there is no co relation between serum IgE and vitamin D levels.

DISCUSSION

The trial on the efficacy of vitamin D supplementation in allergic rhinitis (AR) demonstrated several significant findings. Firstly, adding vitamin D to nasal steroid spray resulted in statistically significant improvements in total nasal symptom score (TNSS), Group B (with vitamin D supplementation) exhibited better outcomes in terms of the difference in reduction of TNSS and average post-treatment score compared to Group A.

Furthermore, the study found a correlation between the severity of vitamin D deficiency and the severity of allergic rhinitis symptoms, indicating that more severe vitamin D deficiency was associated with more severe allergic rhinitis. This observation underscores the potential importance of vitamin D levels in the management of AR. The study found there is no co relation between serum IgE and vitamin D levels.

In a randomized, placebo-controlled, double-blind study on patients with Seasonal Allergic Rhinitis (SAR) conducted by F.M. Baroody and J. Lane, it was found that adding Vitamin D to an intranasal spray provided significant additional therapeutic benefits in SAR. This observation aligns with our current trial, where the addition of Vitamin D to fluticasone nasal spray not only improved Total Nasal Symptom Score (TNSS) but also significantly enhanced the Rhino Conjunctivitis Quality of Life Questionnaire (RACT) score (11).

Another study by Upadhaya et al. focusing on the pediatric population also demonstrated a significant reduction in symptoms of allergic rhinitis when oral Vitamin D was added to the standard treatment regimen for allergic rhinitis (11).

Vitamin D has long been recognized as an essential nutrient for the human body, particularly for the absorption of dietary calcium and phosphate. Technically classified as a steroid hormone rather than a true vitamin, Vitamin D acts through its nuclear hormone receptor, the Vitamin D receptor (VDR), which is expressed in at least seventeen tissues or cells (12,13).

Studies conducted by Yenigun et al., Vatankhah et al., and Sudiro et al. showed a correlation between Vitamin D deficiency and the classification of allergic rhinitis, with a significant proportion of allergic rhinitis patients exhibiting severe Vitamin D deficiency (14,15). Additionally, several other researchers have reported that Vitamin D supplementation in allergic rhinitis patients leads to significant clinical improvements, altering the natural course of allergic rhinitis towards better outcomes (16-24).

Despite the strengths of the trial, such as careful patient selection, use of validated outcome measures, and appropriate dose of vitamin D and fluticasone, there were several limitations. These included a small cohort, short follow-up duration, selection of patients only with vitamin D deficiency, concerns about internal and external validity, and potential bias in treatment outcomes due to the subjective nature of patient-reported questionnaires.

These findings underscore the potential therapeutic role of vitamin D supplementation in the management of allergic rhinitis, highlighting the importance of addressing vitamin D status in AR patients to optimize treatment outcomes (25,26,27).

CONCLUSION

While the addition of vitamin D to treatment regimens for allergic rhinitis shows promise results in symptom improvement, further extensive multi-institutional research is necessary to fully understand its therapeutic potential and implications for clinical practice.

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