

**CORRELATION BETWEEN SERUM VITAMIN D3 LEVEL AND ALLERGIC RHINITIS-  
AN OPD BASED PROSPECTIVE OBSERVATIONAL STUDY**Swarnali Paul<sup>1\*</sup>, Souvik Ghosh<sup>1</sup>, Ram Narayan Maiti<sup>1</sup>, Sekhar Mandal<sup>1</sup>, Dipan Saha<sup>1</sup> and Subhayan Das<sup>1</sup><sup>1</sup>Department of Pharmacology, Midnapore Medical College.**\*Corresponding Author: Swarnali Paul**

Department of Pharmacology, Midnapore Medical College.

Article Received on 03/07/2019

Article Revised on 24/07/2019

Article Accepted on 13/08/2019

**ABSTRACT**

**Background:** Allergic rhinitis is one of the most common allergic diseases worldwide, affecting about 10-25% of population and its prevalence is increasing day by day. New evidence suggests a possible link between allergic rhinitis and low serum vitamin D3 level. **Objective:** To evaluate whether Serum Vitamin D3 level has any correlation with severity of disease spectrum among allergic rhinitis patients. **Material and method:** This prospective observational study was carried out in 6 months from January 2018 to June 2018 in ENT OPD of Midnapore medical college and Hospital. All patients of Allergic Rhinitis diagnosed clinically underwent Serum IgE and serum Vitamin D3 levels examination. The severity of allergic rhinitis was measured by Allergy Symptom Scoring as per ARIA-WHO guideline. **Results:** A total of 84 patients (34 males, 50 females, aged >12 years) were included in the study. 56 patients (66%) out of these 84 patients had a low serum vitamin D3 level. And out of these 56 patients of allergic rhinitis with hypovitaminosis D3, 40 patients (71%) were classified as having persistent moderate-severe allergic rhinitis based on ARIA-WHO classification. Low Vitamin D3 level was found to be significantly correlated with severity of allergic rhinitis status ( $p < 0.05$ ). **Conclusion:** - We found that low serum vitamin D3 level was correlated with severity of Allergic rhinitis and a significant proportion of allergic rhinitis patients showed a low serum vitamin D3 level.

**KEYWORDS:** allergic, rhinitis, Vitamin D3.**INTRODUCTION**

Allergic Rhinitis is an IgE mediated hypersensitivity disorder of the mucus membrane of the nasal airways characterized by sneezing, rhinorrhea, nasal obstruction, conjunctival and pharyngeal irritation and lacrimation.<sup>[1]</sup> The lining of the nose is continuous with that of the Para nasal sinus which may also be involved. This chronic inflammatory disorder may occur in seasonal or perennial forms. According to allergic Rhinitis and its impact on Asthma (ARIA) guidelines, allergic rhinitis can be classified into intermittent and persistent forms depending on the timing of symptom instead of its old classification of perennial and seasonal varieties.<sup>[2,3]</sup> Atopic individuals are pre disposed to allergic rhinitis due to deposition of various airborne allergens on the nasal mucus membrane.<sup>[4]</sup>

Allergic rhinitis has a high prevalence, affecting 10-25% of the general population.<sup>[4,5]</sup> Although not disabling, allergic rhinitis can adversely affect quality of life to a substantial degree.<sup>[6]</sup> Several hypotheses have proposed that active form of vitamin D3 play a role in allergic pathogenesis through innate and adaptive immunity. 1, 25-Dyhydroxyvitamin D3 has been shown and to promote Th2 activities and promotes IL-10 and Foxp3 (a regulatory T-cell profiles) expression.<sup>[7,8]</sup>

In recent years, many published studies have examined the relationship between allergic diseases and low serum vitamin D3 levels.<sup>[9]</sup> The Aim of this study is to investigate whether low vitamin D3 status in allergic rhinitis patients is associated with more severe clinical presentation at the compared to ENT OPD of Midnapore medical college and Hospital.

**AIMS AND OBJECTIVES**

To evaluate whether Serum Vitamin D3 level has any correlation with severity of disease spectrum among allergic rhinitis patients attending ENT OPD in a tertiary care teaching hospital.

**MATERIALS AND METHODS**

It was a prospective observational study spanning over 24 weeks involving patients of allergic rhinitis aged >12 years of either gender and presented to ENT OPD of a tertiary care hospital. The AR patients were clinically diagnosed according to the criteria of *Allergic Rhinitis and its Impact on Asthma* (ARIA). A total of 84 patients were recruited in the study. At baseline visit the Total nasal symptom score of the patients were recorded and patients were asked to come back after 1 week with their Serum vitamin D3 level report. Previously, the study has been approved by the Institutional Ethics committee. All

subjects gave their informed consent before the study. The exclusion criteria included acute respiratory tract infections, acute and chronic Para nasal sinusitis, severe septal deviation, obstructive nasal disease, upper respiratory infection, asthma under treatment, hypercalcemia, severe hypertension, anaemia, coronary heart disease, renal and liver impairment, pregnant and lactating conditions, damaged blood preparation, or examination failure.

The total nasal symptom score (a runny nose, nasal congestion, sneezing and itchy nose) was assessed based on the severity of the symptoms. The severity degree of each symptom was based on the following scores: 0 = no symptom; 1 = mild, unobtrusive symptoms; 2 = moderate, disturbing but tolerable symptoms; and 3 = severe, disturbing, perceived to interfere with daily activities/sleep and difficult to tolerate. The maximum total nasal symptom score was 12.

The serum vitamin D levels were measured by employing the electrochemiluminescence immunoassays (ECLIA) method using Cobas E411 (fully automated) hormone-immunoassay analyser. Normal vitamin D is defined when 25(OH)D level ranges between 30-60ng/mL while vitamin D insufficiency is defined to be between 20 and 30ng/mL and vitamin D deficiency is defined to be under 20 ng/mL.

#### Statistical analysis

Descriptive data were expressed in Mean $\pm$ SD or Median & IQR (in case of numerical variables) and in numbers & percentages (in case of categorical variables). To compare the parametric and non-parametric variables appropriate statistical tests and tools were utilized accordingly. For comparison two tailed P value of less than 0.05 will be considered as significant. Standard statistical software like Microsoft excel, SPSS 21, were utilized for this purpose.

#### RESULTS

The study was conducted to evaluate whether Serum Vitamin D3 level has any correlation with severity of disease spectrum among allergic rhinitis patients. Among the patients attending ENT OPD of Midnapore medical college and hospital 84 patients met the inclusion criteria and got recruited in the study.

Among the study population majority was female 50(59.05%), vide Fig 1. Study subjects had a mean age of 39.22 $\pm$ 12.71 years, most of them were aged between 41-55 years age group as depicted in Fig 2.

Among the study population majority of the patient were from persistent moderate- severe group 40 (47.61%) followed by persistent mild 23 (27.38%), Intermittent moderate-severe 17 (20.23%) and very few patient in Intermittent mild group 4 (4.76%), vide Fig 3.

Majority of the patient 39 (46.42%) had severe Total Nasal Symptom Score(TNSS) followed by moderate TNSS 31(36.90%) and only 14 (16.66%) patient had mild TNSS as depicted in Fig 4. The mean of TNSS was 7.84 $\pm$ 3.45.

Among the study population it was found to be that 36 (42.85%) patient had got deficient (<20ng/dl) Serum vitamin D3 level and 20(23.80%) patient had got insufficient (20-30 ng/dl) serum vitamin D3 level in their blood. Only 28 (33.33%) patient among the study population had sufficient (>30 ng/dl) serum vitamin D3 in their blood, vide Fig 5. The mean of vitamin D3 level among study population was 22.54 $\pm$ 9.03 ng/dl.

From Fig 6, it was noted that among 39 patients who had got severe total nasal symptom score, 36 (92.30%) patients out of them having deficient serum vitamin D3 level in their blood. The p value is <0.001.

From Fig 7 it was found to be that among 56 patients of allergic rhinitis with hypovitaminosis D3, 40 patients (71.42%) were classified as having persistent moderate-severe allergic rhinitis based on ARIA-WHO classification. Low Vitamin D3 level was found to be significantly correlated with severity of allergic rhinitis status (p<0.001). [Table 1]

The spearman correlation value was (-0.892). It means there is strong negative correlation between serum vitamin D3 level and severity of allergic Rhinitis.

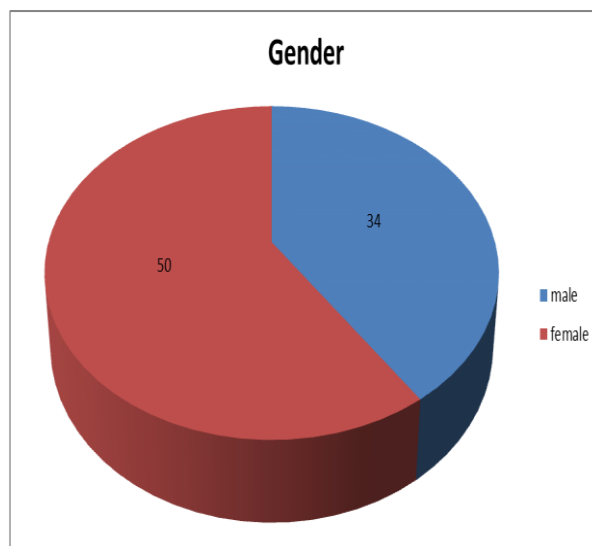


Fig 1: Gender-wise distribution in study population.

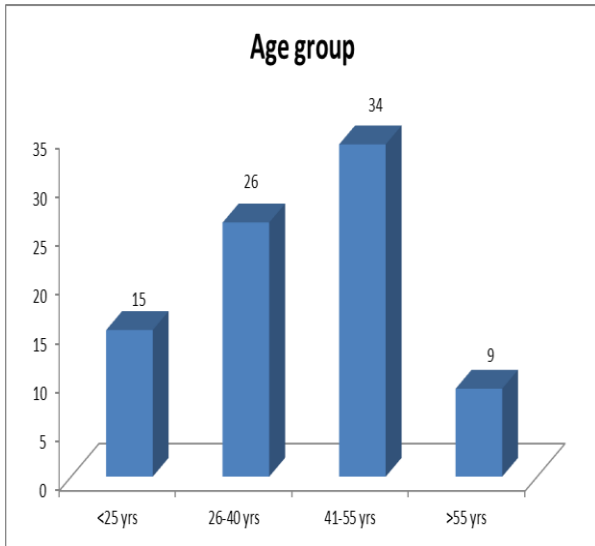


Fig 2: Age wise distribution.

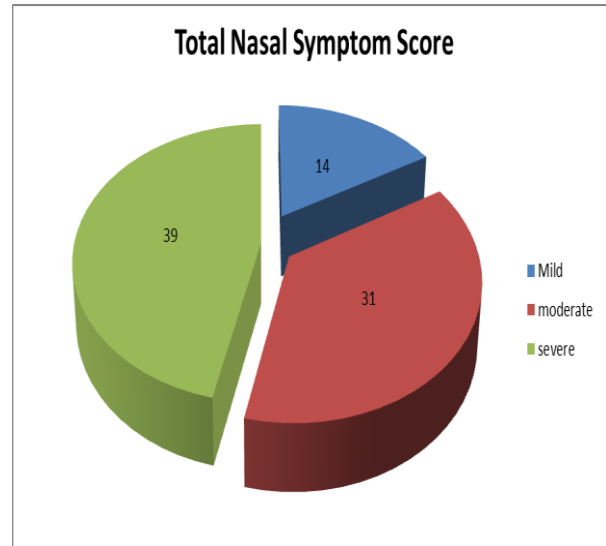


Fig 4: Total Nasal Symptom Score among the study population.

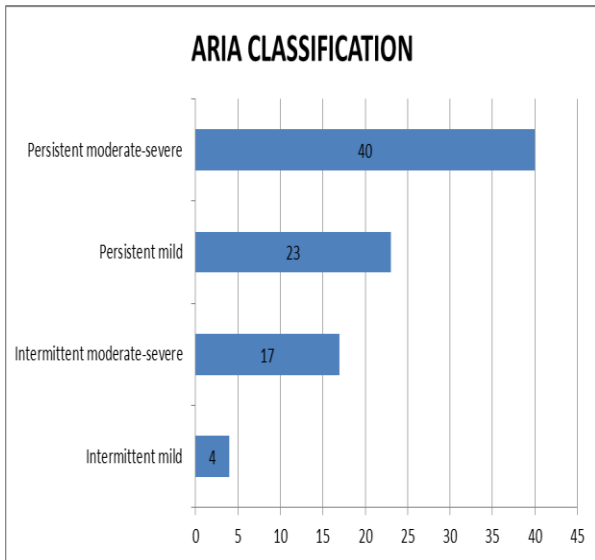


Fig 3: ARIA-WHO classification wise distribution of study population.

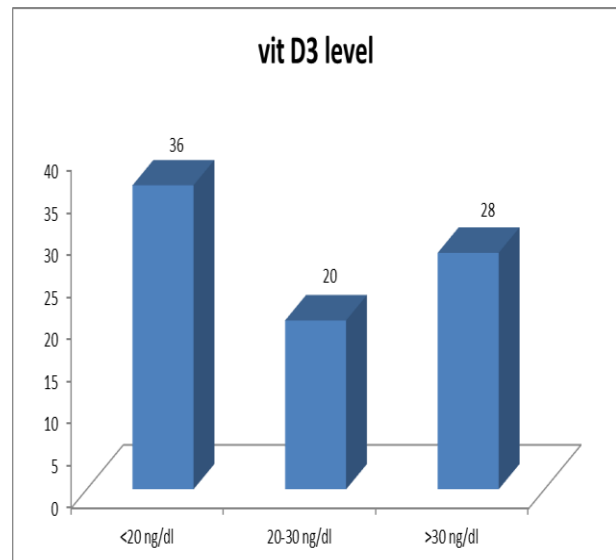


Fig 5: Vitamin D3 level among the study population.

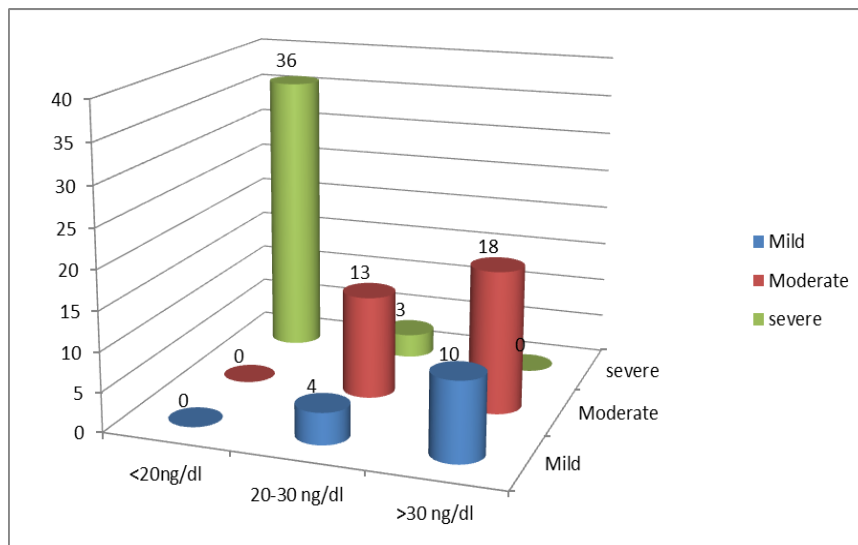


Fig 6: Vitamin D3 level and Total nasal symptom score.

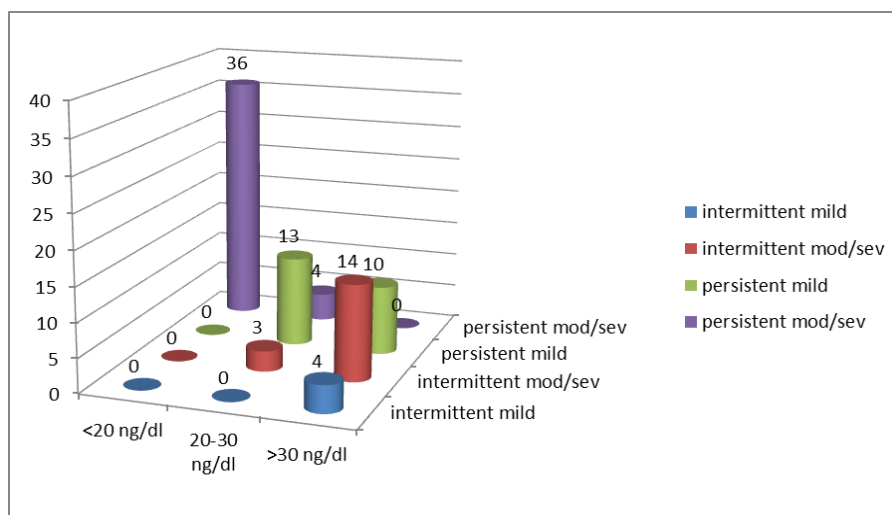


Fig 7: Vitamin D3 level and ARIA-WHO classification.

Table 1: Vitamin D3 level and ARIA cross-tabulation.

Vitamin D3level	Intermittent mild	Intermittent moderate-severe	Persistent mild	Persistent moderate-severe	P value
<20 ng/dl	0	0	0	36	<0.001
20-30 ng/dl	0	3	13	4	
>30 ng/dl	4	14	10	0	

## DISCUSSION

In Allergic rhinitis, plenty of inflammatory cells, including mast cells, CD4-positive T-cells, B-cells, macrophages, and eosinophils, infiltrate in the nasal lining on exposure to an inciting allergen (most commonly airborne dust mite particles, cockroach residues, animal dander, molds and pollens).<sup>[10]</sup> During the early phase of an immune response to an allergen the mediators and cytokines are released which trigger a further cellular inflammatory response over the next 4-8 hours (late phase inflammatory response) which results in recurrent symptoms (usually nasal congestion).<sup>[11]</sup> Infiltration of inflammatory cells is very much evident in both seasonal and perennial form, though the magnitude of these cellular changes is somehow different in seasonal and perennial form of the disease.<sup>[12]</sup> The T-cells infiltrating the nasal mucosa are predominantly T helper (Th 2 ) cells in nature and release cytokines (e.g. interleukin [IL]-3, IL-4, IL-5, and IL-13) that promote immunoglobulin E (IgE) production by plasma cells. IgE production, in turn, triggers the release of mediators, like histamine and leukotriene, which leads to arteriolar dilation, increased vascular permeability, itching, rhinorrhoea (runny nose), mucous secretion, and smooth muscle contraction.<sup>[13]</sup>

In this study we found that serum vitamin D3 level was low in patients of allergic rhinitis. The vitamin D3level in this study was 22.54±9.03 ng/dl. Similarly, a study by Yalcinkaya et al. showed that the serum vitamin D levels of the AR patients were lower than the non-AR group.<sup>[14]</sup>

This study found evidence of a strong, negative relationship (spearman correlation value is -0.892)

between serum vitamin D levels with AR incidence and TNSS. It indicates that vitamin D plays an important role in the AR symptoms because the level could be detected in the serum of AR patients and the value was inversely proportional to TNSS. Thakkar et al., also found a negative relationship between serum vitamin D levels with TNSS with moderate correlation strength.<sup>[9]</sup>

## CONCLUSION

In conclusion, a strong, negative correlation was found between serum vitamin D levels with AR and TNSS. Low serum vitamin D3 level was correlated with severity of Allergic rhinitis and a significant proportion of allergic rhinitis patients showed a low serum vitamin D3 level.

However, further randomised controlled trials involving large number of subjects are required to strengthen the claim made by this study. Vitamin D as a potential therapeutic regimen for allergic rhinitis treatment may reduce the severity of the disease spectrum and control the frequent attacks of allergic rhinitis.

## REFERENCES

1. Lakhani N, North M, Ellis K Anne. Clinical Manifestations of Allergic Rhinitis. Journal of Allergy & Therapy, 2012; 5: 007.
2. Brozek Jan L, Bousquet J, Agache L, Agarwal Arnav, Bachert Claus, Bosnic Antisevich S, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) Guidelines—2016 revision, J ALLERGY CLIN IMMUNOL, Oct, 2017; 140(4): 950-8.
3. Simoni M, Maio S, Baldacci S, Angio A, Silvi P, Borbotti M et al. Prescribing patterns for allergic

- rhinitis in general practice setting: Adherence to ARIA guidelines. *European Respiratory Journal*, 2011; 38: 4625.
4. Seidman MD, Gurgel R K, Lin SY, Schwartz SR, Baroody FM, Bonner JR, et al. Clinical Practice Guideline: Allergic Rhinitis Executive Summary. *Otolaryngology–Head and Neck Surgery*, 2015; 152(2): 197–206.
  5. Seo MY, Kim DK, Jee HM, Ahn YM, Kim YM, Hong SD, et al. A survey of Korean physicians' prescription patterns for Allergic Rhinitis. *Clinical and Experimental Otorhinolaryngology*, Dec, 2017; 10(4): 332-7.
  6. Takahasi G, Matsuzaki Z, Nakayama T and Masuyama K. Patterns of Drug Prescription for Japanese Cedar Pollinosis Using a Clinical Vignette Questionnaire. *Allergy International*, 2008; 57: 405-411
  7. Cantorna, M.T., Snyder, L., Lin, Y.D. and Yang, L. Vitamin D and 1, 25(OH)2D Regulation of T Cells. *Nutrients*, 2015; 7: 3011-3021.
  8. Hewison M. Vitamin D and Innate and Adaptive Immunity. *Vitamins and Hormones*, 2011; 86: 23-62.
  9. Thakkar B, Katarkar A, Modh D, Jain A, Shah P, Joshi K. Deficiency of Vitamin D in Allergic-Rhinitis: a Possible Factor in Multifactorial Disease. *J Clin Rhinol*, 2014; 7(3): 112–6.
  10. Small P, Frenkiel S, Becker A, Boisvert P, Bouchard J, Carr S, et al. The Canadian Rhinitis Working Group: Rhinitis: A practical and comprehensive approach to assessment and therapy. *J Otolaryngol*, 2007; 36(1): S5-27.
  11. Lee P, Mace S. An approach to allergic rhinitis. *Allergy Rounds*, 2009; 1: 1.
  12. Howarth PH. Eosinophils and rhinitis. *Clin Exp Allergy*, 2005; 5: 55-63.
  13. Dykewicz MS, Hamilos DL. Rhinitis and sinusitis. *J Allergy Clin Immunol*, 2010; 125: S103-15.
  14. Yalcinkaya E, Tunckasik M, Guler I, Kocaturk S, Gunduz O. Evaluation of The Correlation of 25-hydroxyvitamin-D Serum Levels with Allergic Rhinitis. *ENT Updates*, 2015; 5(1): 19–22.