



## UPPER RESPIRATORY TRACT ALLERGY; VITAMIN D, BLOOD EOSINOPHILS AND IGE IN THE UPPER RESPIRATORY TRACT ALLERGY IN RURAL POPULATION OF SINDH

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**ABSTRACT... Objectives:** To evaluate serum vitamin D<sub>3</sub>, Blood Eosinophils, Absolute Eosinophils Counts and IgE in the upper respiratory tract allergies (URTA) in Rural Population Sindh. **Study Design:** Case control study. **Place and Duration:** Department of Medicine and Biochemistry, Isra University from January 2014 to October 2015. **Subjects & Methods:** A sample of 50 diagnosed cases of URTA and 50 age and gender matched control subjects were selected through non-probability sampling. Blood samples were centrifuged to separate sera. Serum vitamin D<sub>3</sub>, Blood Eosinophils, Absolute Eosinophils and serum IgE were estimated. Data was analyzed on the SPSS 22.0 software at 95% confidence interval (P≤0.05). **Results:** Vitamin D<sub>3</sub> showed significant decrease in allergic subjects; noted as 26.96±9.75 ng/dl compared to 32.62±11.75 ng/dl in controls. Blood Eosinophils (%) were raised in the allergic subjects compared to controls 3.42±1.91 and 1.93±0.65 respectively (p=0.0001). Absolute Eosinophils counts (AEC) were significantly raised in the allergic cases as shown in Table-I (p=0.0001). Serum IgE in controls and cases was noted as 86.7±17.39 and 400.26±232.8 IU/ml respectively (p=0.0001). **Conclusion:** The present study reports vitamin D<sub>3</sub> deficiency associated with raised Eosinophils, Absolute Eosinophils counts and serum IgE in upper respiratory tract allergy.

**Key words:** Allergy, Eosinophils, IgE, Vitamin D<sub>3</sub>, Upper respiratory tract.

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## INTRODUCTION

Upper respiratory tract allergies (URTA) are among the most common chronic allergic medical problems. Approximately 50 million people are suffering from URTA. The URTA include Allergic rhinitis (AR) Seasonal allergies (SA), and are common among both adults and children.<sup>1</sup> AR and SA are common complaints the patients present with in the daily clinical practice. Frequency of URTA is increased mainly to change environmental pollution, motor vehicle and industrial fumes. URTA contribute for the social and financial loss in the community. Pollen grains are plant derived particles and cause seasonal allergies. The clinical symptoms vary from mild flu and sneezing to severe allergic rhinitis, allergic asthma, etc.<sup>1,2</sup> URTA are a type of chronic respiratory IgE mediated conditions characterized mainly by inflammation of the upper respiratory tract.<sup>1,2</sup> The inflammation is mediated

by the IgE mediated histamine secretion by the mast cells and basophils. T lymphocytes play role in the induction of allergic reactions. Histamine is a potent vasodilator which increases the goblet secretions as mucus and the air way spasm. These events produce the allergic symptoms.<sup>3,4</sup> Recently, much research has been reported on the vitamin D in the allergic conditions. Previous studies suggest low vitamin D levels<sup>5</sup> increase the likelihood of allergy conditions. Some studies suggest that the vitamin D functions as immune enhancer and exerts anti allergic effects.<sup>6,7</sup> Vitamin D regulates the T lymphocyte functions and modulates inflammatory phenomena. Research shows the vitamin D deficiency casues immune dysfunction and increases the chances of allergic conditions of respiratory passages.<sup>8</sup> Currently, a growing body of research has reported the relationship of vitamin D as risk factor for the allergic disorders.<sup>9</sup> Many studies from Pakistan

have reported high prevalence of vitamin D deficiency.<sup>10</sup> As the allergic conditions are also increasing in the Pakistan, but studies are lacking. The present small scale case control study was conducted to evaluate the serum vitamin D, serum IgE and blood Eosinophils in upper respiratory tract allergic conditions. The aim of this study was to establish association of vitamin D deficiency in the adult population suffering from upper respiratory tract allergic conditions.

## SUBJECTS AND METHODS

The present case control study was conducted at the Department of Medicine and Biochemistry, Isra University from January 2014 to October 2015. Subjects with upper respiratory tract allergies presenting were selected through non-probability sampling. History of clinical symptoms including a family history, exposure to allergens, and occupation were enquired in detail. Diagnosed cases of upper respiratory tract allergies of 15-50 years age was the inclusion criteria. Subjects suffering from lower respiratory tract disease, diabetes mellitus, liver disease, pulmonary disease, chronic obstructive pulmonary disease and steroid therapy were excluded. Subjects taking multivitamin pills were strict exclusion criterion. Volunteer subjects were informed about purpose of study and signing of consent proforma. Ethical review committee permission was taken in advance. 5 ml of blood was collected from ante cubital vein by Venepuncture. For blood cell counts, EDTA bottles were used. Blood samples were centrifuged to separate sera for estimation

of serum vitamin D<sub>3</sub> and serum IgE. Absolute Eosinophils counts (AEC) were calculated by formula % of Eosinophils X WBC. Reference range for AEC was 30-350 eosinophils. ARCHITECT I 1000 system was available for the serum vitamin D<sub>3</sub> detection. Serum total IgE was determined by ELISA assay commercial kits. Confidentiality of patient's data was maintained. Data was analysed on software SPSS 22.0. Student's t test and Chi square test were used for the numerical and categorical variables analysis respectively. Data analysis was performed at 95% confidence interval (P ≤ 0.05).

## RESULTS

Age in controls and cases was noted 30.0±9.02 and 31.18±11.04 years respectively. Of 100 study subjects, male were 37 and 36 and female were 13 and 14 in controls and cases respectively (X<sup>2</sup>= 0.156, P= 0.813). Study subjects were age, gender, body weight and systemic blood pressure matched as shown in table 1. Blood Eosinophils (%) were raised in the allergic subjects compared to controls 3.42±1.91 and 1.93±0.65 respectively (t= -12.42, p=0.0001). Absolute Eosinophils counts (AEC) were significantly raised in the allergic cases as shown in Table-I (t= -11.32, p=0.0001). Serum IgE in controls and cases was noted as 86.7±17.39 and 400.26±232.8 IU/ml. respectively (t=-18.15, p=0.0001). Vitamin D<sub>3</sub> showed significant decrease in allergic subjects. Vitamin D<sub>3</sub> was noted as 32.62±11.75 and 26.96±9.75 ng/dl respectively (t= 9.04, p=0.010). Table-II

	Controls (n=50)	Cases (n=50)	P-value
Age (years)	30.0±9.02	31.18±11.04	0.56
Body weight (Kg)	65.7±9.16	67.5±8.16	0.91
Systolic BP (mmHg)	119±9.12	124±7.15	0.90
Diastolic BP (mmHg)	69.5±7.5	70.0±9.5	0.86
Blood Eosinophils	1.93±0.65	3.42±1.91	0.0001
AEC (/μL)	124.52±41.3	279.4±71.41	0.0001
Serum IgE (IU/L)	86.7±17.39	400.26±232.8	0.0001
Vitamin D <sub>3</sub> (ng/dl)	32.62±11.75	26.96±9.57	0.010

AEC- Absolute Eosinophil counts

Table-I. Characteristics of study subjects

	Controls (n=50)	Cases (n=50)	P-value
Deficient (< 20 ng/mL)	7(14%)	8 (16%)	0.32
Insufficient (20-30 ng/mL)	23 (46%)	29 (58%)	
Sufficient (> 30 ng/mL)	20 (40%)	13 (26%)	

Table-II. Vitamin D categories of study subjects

## DISCUSSION

A search of published literature and to the best of knowledge, the present research is first time being reported from our tertiary care hospital. Vitamin D<sub>3</sub> deficiency is prevalent in Pakistan. Vitamin D<sub>3</sub> in upper respiratory tract allergies was studied in association with the blood eosinophils, absolute eosinophil counts and serum IgE. Vitamin D<sub>3</sub> deficiency was found in URTA associated with raised eosinophils, absolute eosinophils counts and serum IgE (P<0.05). The findings of present study are in agreement with previous studies.<sup>11,12</sup> The findings are of clinical importance as the vitamin D<sub>3</sub> deficiency if treated timely may positively benefit the URTA related morbidities.

A previous study<sup>13</sup> reported vitamin D<sub>3</sub> deficiency was found in the allergic asthma in the children, the finding is in agreement with the present study. Another previous study<sup>14</sup> suggested the vitamin D<sub>3</sub> deficiency makes the persons prone to infections; hence its deficiency leads to exaggerations of asthma symptoms. This is because the vitamin D<sub>3</sub> is necessary for the immunological processes at different molecular levels.<sup>15</sup> Vitamin D<sub>3</sub> is an immunomodulatory, involved in the T helper cell physiology and bacterial killing.<sup>16</sup> Vitamin D<sub>3</sub> deficiency is postulated to augment the inflammatory reactions against infections resulting in exaggeration of allergic symptoms.<sup>15</sup> Vitamin D<sub>3</sub> deficiency is established existing widely in the general Pakistani population.<sup>17,18</sup> Vitamin D<sub>3</sub> deficiency may exaggerate allergic reactions; one proposed mechanism is its deficiency is associated with low anti inflammatory IL-10 cytokine biosynthesis.<sup>16</sup> Vithalani<sup>19</sup> conducted study on the 105 children from Georgia to assess the correlation of vitamin D<sub>3</sub> deficiency in childhood allergies. They reported positive association of vitamin D<sub>3</sub> deficiency in childhood allergies.

They concluded that the vitamin D<sub>3</sub> deficiency is

a risk for the exaggerated allergic reactions.<sup>19</sup> The findings present study are supported by above study. Previous study<sup>19</sup> suggested the vitamin D<sub>3</sub> deficiency is frequent allergic patients but may be a risk of increased and altered inflammatory response responsible for the allergic symptoms. El-Gazzar<sup>20</sup> reported a recent study to evaluate the serum IgE and Vitamin D<sub>3</sub> in 30 allergic asthmatic subjects during acute exacerbation and after remission. They reported severe vitamin D<sub>3</sub> deficiency in allergic asthmatics as associated with increased IgE, the findings are similar to the present study. A previous study<sup>21</sup> reported severe vitamin D<sub>3</sub> deficiency (<20 ng/ml) is associated with severity of clinical symptoms of allergic rhinitis. Previous studies<sup>22,23</sup> reported vitamin D<sub>3</sub> deficiency in 67% and 91% of allergic patients respectively. Also other studies<sup>24,25</sup> reported similar results of severe vitamin D<sub>3</sub> deficiency in allergic patients.

The present study observed raised serum IgE level, eosinophil and AEC in association with vitamin D<sub>3</sub> deficiency in URTA patients. The findings of present study in agreement with above cited studies. Vitamin D supplements may be beneficial in alleviation, cure and treatment of upper respiratory tract allergies. The limitations of present study include; first- cross sectional design hence cause- effect relationship is not possible to ascertain, second- small sample which belongs to particular ethnicity hence findings cannot be generalized to other settings.

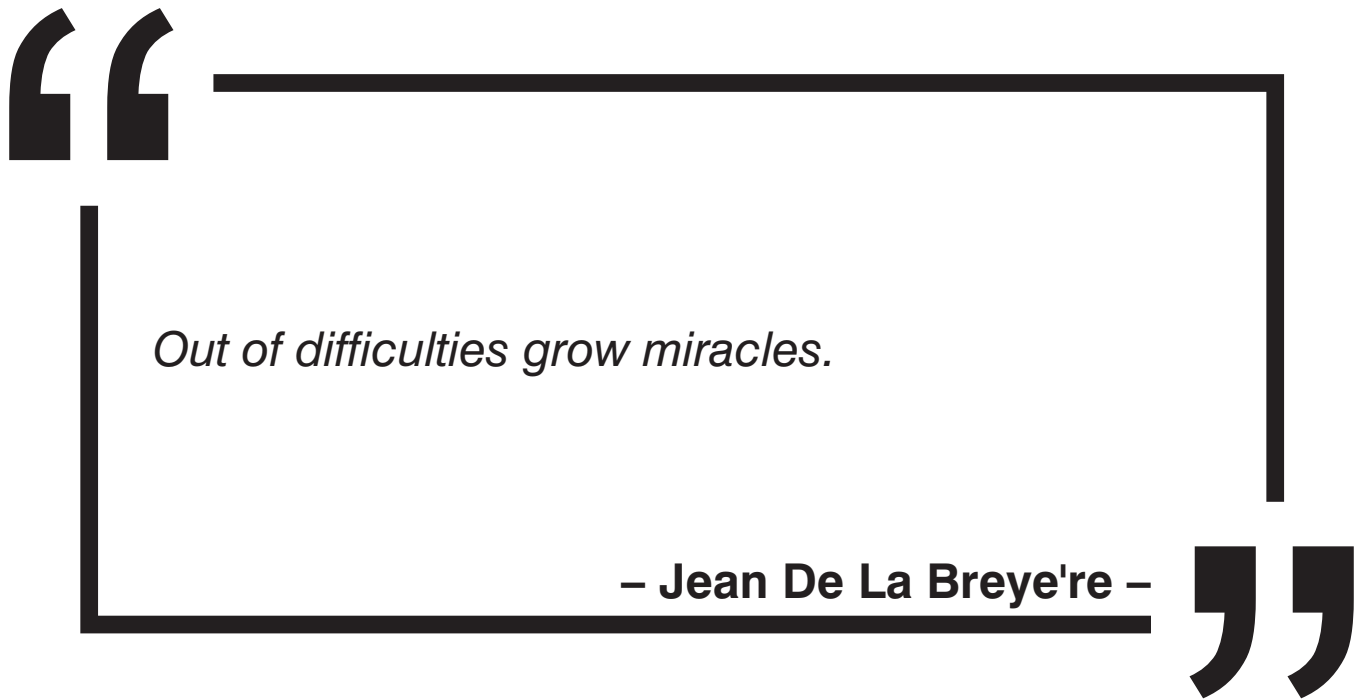
## CONCLUSION

Vitamin D<sub>3</sub> deficiency and elevated eosinophils, absolute eosinophils counts and serum IgE were found in adult subjects suffering upper respiratory tract allergy. Vitamin D<sub>3</sub> supplements may prove helpful in alleviating upper respiratory tract allergy.


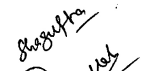
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#### AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
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2	Shagufta Shaheen Qureshi	Literature review, manuscript writing, data collection.	
3	Asadullah Yousfani Palli	Data collection and analysis, manuscript writing.	