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.\(^1\) 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.\(^1,2\) URTA are a type of chronic respiratory IgE mediated conditions characterized mainly by inflammation of the upper respiratory tract.\(^1,2\) 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.\(^3,4\) Recently, much research has been reported on the vitamin D in the allergic conditions. Previous studies suggest low vitamin D levels\(^5\) increase the likelihood of allergy conditions. Some studies suggest that the vitamin D functions as immune enhancer and exerts anti allergic effects.\(^6,7\) 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.\(^8\) Currently, a growing body of research has reported the relationship of vitamin D as risk factor for the allergic disorders.\(^9\) Many studies from Pakistan
have reported high prevalence of vitamin D deficiency. 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 \( D_3 \), 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 \( D_3 \) 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 \( D_3 \) 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 (\( P \leq 0.05 \)).

**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 (\( X^2 = 0.156, P = 0.813 \)). 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 \( IgE \) counts 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 \( D_3 \) showed significant decrease in allergic subjects. Vitamin \( D_3 \) was noted as 32.62±11.75 and 26.96±9.75 ng/dl respectively (\( t = 9.04, P = 0.010 \)). Table-II

<table>
<thead>
<tr>
<th>Controls (n=50)</th>
<th>Cases (n=50)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>30.0±9.02</td>
<td>31.18±11.04</td>
</tr>
<tr>
<td>Body weight (Kg)</td>
<td>65.7±9.16</td>
<td>67.5±8.16</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>119±9.12</td>
<td>124±7.15</td>
</tr>
<tr>
<td>Diastolic BP (mmHg)</td>
<td>69.5±7.5</td>
<td>70.0±9.5</td>
</tr>
<tr>
<td>Blood Eosinophils</td>
<td>1.93±0.65</td>
<td>3.42±1.91</td>
</tr>
<tr>
<td>AEC (µL)</td>
<td>124.52±41.3</td>
<td>279.4±71.41</td>
</tr>
<tr>
<td>Serum IgE (IU/L)</td>
<td>86.7±17.39</td>
<td>400.26±232.8</td>
</tr>
<tr>
<td>Vitamin ( D_3 ) (ng/dl)</td>
<td>32.62±11.75</td>
<td>26.96±9.57</td>
</tr>
</tbody>
</table>

AEC- Absolute Eosinophil counts

**Table-I. Characteristics 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 D₃ deficiency is prevalent in Pakistan. Vitamin D₃ in upper respiratory tract allergies was studied in association with the blood eosinophils, absolute eosinophil counts and serum IgE. Vitamin D₃ 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. The findings are of clinical importance as the vitamin D₃ deficiency if treated timely may positively benefit the URTA related morbidities.

A previous study reported vitamin D₃ deficiency was found in the allergic asthma in the children, the finding is in agreement with the present study. Another previous study suggested the vitamin D₃ deficiency makes the persons prone to infections; hence its deficiency leads to exaggerations of asthma symptoms. This is because the vitamin D₃ is necessary for the immunological processes at different molecular levels. Vitamin D₃ is an immunomodulatory, involved in the T helper cell physiology and bacterial killing. Vitamin D₃ deficiency is postulated to augment the inflammatory reactions against infections resulting in exaggeration of allergic symptoms. Vitamin D₃ deficiency is established existing widely in the general Pakistani population. Vitamin D₃ deficiency may exaggerate allergic reactions; one proposed mechanism is its deficiency is associated with low anti inflammatory IL-10 cytokine biosynthesis. Vithalani conducted study on the 105 children from Georgia to assess the correlation of vitamin D₃ deficiency in childhood allergies. They reported positive association of vitamin D₃ deficiency in childhood allergies.

They concluded that the vitamin D₃ deficiency is a risk for the exaggerated allergic reactions. The findings present study are supported by above study. Previous study suggested the vitamin D₃ deficiency is frequent allergic patients but may be a risk of increased and altered inflammatory response responsible for the allergic symptoms. El-Gazzar reported a recent study to evaluate the serum IgE and Vitamin D₃ in 30 allergic asthmatic subjects during acute exacerbation and after remission. They reported severe vitamin D₃ deficiency in allergic asthmatics as associated with increased IgE, the findings are similar to the present study. A previous study reported severe vitamin D₃ deficiency in allergic asthmatics as associated with severity of clinical symptoms of allergic rhinitis. Previous studies reported vitamin D₃ deficiency in 67% and 91% of allergic patients respectively. Also other studies reported similar results of severe vitamin D₃ deficiency in allergic patients.

The present study observed raised serum IgE level, eosinophil and AEC in association with vitamin D₃ 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 D₃ deficiency and elevated eosinophils, absolute eosinophil counts and serum IgE were found in adult subjects suffering upper respiratory tract allergy. Vitamin D₃ supplements may prove helpful in alleviating upper respiratory tract allergy.

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REFERENCES


“Out of difficulties grow miracles.”

– Jean De La Breye're –