Aeroallergens and Food Allergens Sensitization Patterns in Young Adults

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Abstract—The prevalence of aero allergy and food allergy is increasing drastically over the last few years. Allergens exposure is a potent risk factor for sensitization, progression, and severity of allergic diseases, especially in the Asian pediatric community. This study was carried out to investigate the rates of sensitization of aero and food allergens in Lahore. For this purpose, a total of 1000 samples (n=1000) were collected from 5 different allergy centers, and the IgE levels of patients were measured using chemiluminescence linked immunoassay. Based on IgE results, out of a total sample of 1000 patients, an elevated prevalence of aero allergy and food allergy was observed in adults and in children of different age groups. 75% of Infants of age 0-1 year were allergens sensitized. In children of age 1-5 year, 72% were suffering from aero and food allergy, while in children of age 6-9 year, 87.50% were infected. Furthermore, children of age 10-15 year, 47.61% were susceptible to aero allergy and food allergy. However, children outgrow allergies with age. In adults, 67.28% were allergens sensitized, and only 32.71% of adults were found normal. Hence, it is concluded that exposure to poor graded outdoor and indoor air quality is playing a significant role in progression of allergic diseases in adults. The elevated rate of aero allergy and food allergy demands stricter environmental regulations and public health facilities to manage allergic diseases in Pakistan.

Keywords—Food allergens, pollen allergens, Young adults, IgE.

Introduction

Allergen sensitization is commonly recognized as an important risk factor for the evolution of respiratory diseases. Aero allergens are tiny airborne particles that trigger allergic reactions and can cause respiratory allergy in sensitized people. Common aeroallergens are dust mites, cockroaches, livestock, molds, or outdoor (pollens, molds) play a significant role in both chronic inflammations of the airway and acute asthma symptoms [1]. However, food allergens are proteins or glycoproteins and produce malfunctioning of immune system in response to dietary antigens in sensitized individuals [2]. Only a small range of food contributes to food allergic reactions, out of variety of hundred foods that we consume daily.

Allergic reactions are abnormal responses of the immune system to signal the entry of foreign substances into the body that are normally harmless [3]. Nonetheless, acute exposure to allergens in sensitized patients may be responsible for the worsening of upper and lower airway symptoms. The identification of the aeroallergen skin test sensitization becomes mandatory for the optimal management of allergic respiratory conditions.

Allergen sensitization occurs due to increased exposure to allergens in susceptible individuals. This leads a massive production in allergen-specific immunoglobulins E (IgE). When IgE antibodies bind to high affinity IgE receptors (FcRI) on mast cells, mast cells release inflammatory chemicals and onset of symptoms takes place [4]. Environmental components, way of life along with genetics of individuals play an important role in the development of allergic diseases [5]. Aero allergy and food allergy produce adverse health effects on exposure to allergens either by inhalation or ingestion in sensitized individuals. The immune system gets stimulated and generate specific reactions and chemicals, which are often difficult to diagnose because of insufficient modern tests and rapid development of disease [6].

Methods

Study Design and Study Setting

The cross-sectional study was carried out from October 2019 to June 2020. In this study, 1000 patients of all age groups visiting various Allergy Centres of Lahore were included. Demographic data including age, sex, and geographic location were collected using a questionnaire. Medical history including information related to allergy, the duration of sickness, family history and history of smoking was individually interviewed from patients.

Data collection and Statistical Analysis

Diagnosis by IgE test

Blood samples were collected from patients, and serum was separated using ultra-centrifugation. An allergen-specific immunoglobulin E (IgE) test was performed using chemiluminescence linked immunoassay (IgE CLIA Kit) to measure the level of IgE antibodies. The IgE serum level in a patient depends on the magnitude of the allergic responses and the multiple allergens to which patients are sensitized.

IgE Reference values

Patients who visited various allergy centres were divided into five groups on the basis of their IgE reference values. IgE reference values are standard values of IgE that should be found in a normal healthy person. The lesser the IgE values are, the less likely person would be susceptible to aeroallergens and food allergens and vice versa.

Table 1: Laboratory Values of IgE IU/ml on the basis of Age

Group No.	Age groups (Y)	Reference IgE IU/ml
Group 1	0-1 y	30 IU/ml
Group 2	1-5 y	45-60 IU/ml
Group 3	6-9 y	70-90 IU/ml
Group 4	10-15 y	<200 IU/ml
Group 5	Adults 16> y	80.4-100 IU/ml

Data was entered on the excel sheet by using Microsoft Excel 2016. Furthermore, the tables showing the results were also made on the MS excel sheet. The mean values of each age group, frequency, and percentages of allergens sensitized and normal subjects were also calculated on Excel. Statistical analysis was done to find the significance

Results

A total of 1000 (n=1000) subjects participated in the study. The IgE IU/ml from blood was the main predictor of sensitization patterns. The mean age of the whole study population was 34.76 years. The mean IgE of the whole population was 2595.15 IU/ml.

Out of 1000 people, 67.28% adults were having elevated IgE and are more prone to allergies. Children of age 10-15, 57.14% were observed with abnormal IgE level. In newborn babies of 0-1 age, the rate of allergens susceptibility was 75% whereas only 25% were found least effected. In children of age between 1 to 5, 72% of them were with higher IgE level and only 28% subjects were found normal. In growing children of age 6-9, the ratio of catching allergies was 87.50%. The number of normal subjects in this age was minimum than all other age groups

with 12.5%. In age 10-15, 47% subjects were found effected due to raised IgE level. In adults 67.28% were found more vulnerable to aero allergy and food allergy. However, only 32.71% of adults were found resistant to allergies.

It was observed that most of our studied group were not having normally required values of IgE IU/ml and hence are more likely to get aero allergy and food allergy.

Table 2: Percentage of Allergen Sensitized Subjects and Normal Subjects

Sr. No.	Age Groups (n=1000)	Mean Age (Years)	Mean IgE IgE IU/ml	% of allergen sensitized (n=1000)	% of normal subjects (n=1000)
1	0-1	1	189.60	75%	25%
2	1-5	3.12	434.36	72%	28%
3	6-9	7.43	780.53	87.50%	12.5%
4	10-15	13.04	1166.65	57.14%	47.61%
5	Adults (16>)	38.64	2892.67	67.28%	32.71%

Discussion

Aero allergy and food allergy are on the rise in Pakistan as a public health challenge. Pakistan has serious problems with the environment because of numerous anthropogenic behaviors as an agro industrial developing country. Moreover, the prevalence of allergies is also increasing globally [7]. In the past 70 years, the prevalence of allergies has risen to a major public health issue in high-income countries. Genetic modifications alone cannot explain this increase [8]. Environmental air pollution and aeroallergens have been hypothesized as possible causes of this steep rise since the existence of these exposures have evolved over a comparable period of time.

In present study, data of 1000 subjects were divided into 5 age groups based on the difference in their IgE reference values. Out of these total subjects, the rate of allergens sensitization in infants was 75% due to elevated IgE levels. The results were following another similar study conducted in Taiwan. A higher prevalence of sensitization to allergens at 1 and 1.5 years suggests that the elevation of IgE serum levels before the age of 2 could be primarily linked to food allergy instead of aero allergy. It is due to the reason that allergic sensitization in infancy generally occurs first to food allergens. Later with the age, bulk of sensitization against inhaling allergens is switched on rapidly as children get older [9].

In this present study, 67.28% of adults were found affected by having higher IgE level. Owning to fact, adults are continuously and regularly exposed to increasing contamination of the air

and atmosphere due to commercial and increased energy usage to many different pollutants and aeroallergens, hence are more effected by aero allergies [10], [11]. Moreover, adults from the active lifestyle community (31-40 years) cannot always prevent allergic foods due to busy schedules, travel, and dinner meetings due to which they are equally affected by food allergies along with aero allergy. On the contrary, children are often in homes and that their catering habits are well monitored by parents, so they are less susceptible to food allergens in the long term [12].

This research has some limitations. An increase in the incidence of food allergy and aero allergy was observed, that may have resulted from respondent selection bias. Patients who reported allergy-mediated symptoms might have developed non-IgE intolerance. Given these restrictions, a sample size of 1000 (n=1000) was insufficient for detailed data in the scope of allergy and the allergy mediated behavioral choices in citizens of Lahore. In order to better define the actual scope and prevalence of allergies, a multiple cities study will contribute better significant step.

Conclusion

This study was intended to spotlight the current trends of allergic patients in Pakistan as it is counted in neglected diseases. The prevalence of aero allergy and food allergy were higher due to higher IgE levels especially in adults i.e. 67.28% and only 32.71% were found normal. This research also needs thorough general population investigation to examine the patterns of allergy, symptoms, and actual allergy trends.

Conflict of interest: None

References

[1] Moradi, A., Shirkani, A., Tahmasebi, R., Omrani, A., and Farrokhi, S. 2017. Association between aeroallergens and allergic diseases based on skin prick test in Bushehr province. *ISMJ*, **19** (6): 962-971.

[2] Bousquet, J., Lockey, R., and Malling, H. J. 1998. Allergen immunotherapy: therapeutic vaccines for allergic diseases A WHO position paper. *Journal of Allergy and Clinical Immunology*, **102** (4): 558-562.

[3] Biermann, J., Merk, H. F., Wehrmann, W., Klimek, L., and Wasem, J. 2013. Allergic disorders of the respiratory tract—findings from a large patient sample in the German statutory health insurance system. *Allergo Journal*, **22** (6): 366-373.

[4] Beyer, K., and Teuber, S. 2004. The mechanism of food allergy: what do we know today? *Current Opinion in Allergy and Clinical Immunology*, **4** (3): 197-199.

[5] Sicherer, S. H., and Sampson, H. A. 2010. Food allergy. *Journal of allergy and clinical immunology*, **125** (2), S116-S125.

[6] Waserman, S., and Watson, W. 2011. Food allergy. *Allergy, Asthma and Clinical Immunology,* **7** (S1): S7.

[7] Breton, M. C., Garneau, M., Fortier, I., Guay, F., and Louis, J. 2006. Relationship between climate, pollen concentrations of Ambrosia and medical consultations for allergic rhinitis in Montreal, 1994–2002. *Science of the Total Environment*, **370** (1): 39-50.

[8] Rider, C. F., Yamamoto, M., Gunther, O. P., Hirota, J. A., Singh, A., Tebbutt, S. J., and Carlsten, C. 2016. Controlled diesel exhaust and allergen co-exposure modulate microRNA and gene expression in humans: effects on inflammatory lung markers. *Journal of Allergy and Clinical Immunology*, **138** (6): 1690-1700.

[19] Hattevig, G., Kjellman, B., and Bjorksten, B. 1993. The appearance of IgE antibodies to ingested and inhaled allergens during the first 12 years of life in atopic and non- atopic children. *Pediatric Allergy and Immunology*, **4** (4): 182-186.

[10] Lee, S. Y., Chang, Y. S., and Cho, S. H. 2013. Allergic diseases and air pollution. *Asia Pacific Allergy*, **3** (3): 145-154.

[11] Selzle, K., Kampf, C. J., Lucas, K., Lang-Yona, N., Frohlich-Nowoisky, J., Shiraiwa, M., . and Ziegler, K. 2017. Air pollution and climate change effects on allergies in the anthropocene: abundance, interaction, and modification of allergens and adjuvants. *Environmental Science and Technology*, **51** (8): 4119-4141.