

Prevalence of Inhalant and Food Allergies after Skin Prick Testing in Patients with Resistant Allergic Rhinitis in Warm Humid Weather

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Objective: To evaluate the incidence of common food and inhalant allergies.

Design: A Retrospective Study.

Setting: Department of ENT, Bahrain Defense Force (BDF) Hospital.

Method: Patients' records with allergic rhinitis who were subjected to Skin Prick Testing (SPT) from January 2008 to January 2012 were reviewed.

Result: The population under study was almost equally distributed between both genders with minimal female predominance, 312 (52%). Age distribution of positive allergens was almost equally distributed among each decade from 10 to 50 years. Two hundred fifty-eight (43%) were found to have another associated allergic comorbid condition; bronchial asthma was the most common, 186 (31%). *Dermatophagoides pteronyssinus* was the most commonly encountered positive aeroallergen found in 252 (42%), while Walnut was found as the most prevalent food allergen 48 (8%).

Conclusion: In this study, inhalant allergens are more frequently encountered whereas food allergens are less among tested subjects. Weeds, dust mite and animal allergens are most common inhalant allergens. Morbidities associated with allergies are common in Bahrain. Allergic population in Bahrain is diverse in terms of nature of allergens.

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The Austrian pediatrician Clemens Von Pirquet was the first to use the word "allergy" to describe the strange and non disease-related symptoms developing in patients who received horse serum antitoxin¹. The word "allergy" originally comes from the Greek word "aloi" meaning 'change in original state', which does not relate to the recent understanding and development in allergic reaction².

The prevalence of allergic diseases is rising globally, both in developed and developing countries³. Allergic reaction to food and inhalants is a disorder resulting from the ingestion or

inhalation with consequent abnormal immunologically mediated clinical response. The prevalence of allergic rhinitis ranges from 10% to 20% in the USA, UK, Germany, and Switzerland⁴. Allergic rhinitis affects approximately 500 million people⁴. Asthma is a common comorbidity in about 200 million. Globally, it is known that as much as 220-250 million people are known to suffer from food allergy³.

Inhaled allergens get identified during their entry via the respiratory route, which is richly supplied by IgE. As inhaled allergen contacts the mucosal lining of the mouth, nose, and throat, type 1 hypersensitivity reaction leads to the release of mediators resulting in allergic symptoms. Food hypersensitivity affects approximately 6% of children younger than three years and 3.2% of adult population^{5,6}. Food adverse reactions can be allergic or non-allergic.

John Bostock was the first to describe seasonal catarrh or hay fever in 1819⁷. Charles Blakely performed the first known Skin Test by introducing pollen through a small breach in the integrity of his own skin⁸. Leonard Noon started injecting pollen extract in his patients assuming that an “antitoxin” would form and subsequently help neutralize offending “toxin”. By 1940, standardized serial dilutions began to be utilized for skin testing. Since then, it has proven itself as simple, safe, cost-effective and yet a quick test that can give instant results within 20 minutes⁹.

Skin prick test is a form of localized type 1 hypersensitivity which takes place on the introduction of the allergen into the skin with a resultant wheel and flare reaction at the injection site. The test can be performed in a clinic setting, obviating the need of attending specialized laboratories for venipuncture as with RAST. On the other hand, skin prick test, as a technique, can be influenced negatively by number of factors. Results may be misleading if tested during the season of pollen allergy, with concomitant ingestion of allergic food. Antihistamine-dependent patients can be subjected to test only after 36 hours of last antihistamine dose³. Tricyclic antidepressants are also known to inhibit the response¹⁰.

In addition, in vitro testing eliminates variables associated with skin prick tests such as skin types, non-specific wheel and flare and effects of medications¹¹. In vitro testing is more specific but less sensitive as compared to skin prick test. Indications of in vitro testing are the same as skin prick test. Indications of in vitro testing would include skin disorders preventing test administration, antihistamine-dependent patients, anaphylaxis and convenience of testing. Radio Allergo Sorbent Test (RAST) and Modified RAST (MRT) are the most commonly utilized in vitro tests¹².

Allergens can be broadly divided into seasonal and perennial. Seasonal allergens would encompass pollens originating from ragweed, trees, grasses and weeds. Perennial allergens include dust mites, molds, cockroach and pets including cats and dogs.

The aim of this study is to evaluate the incidence of common food and inhaled allergens via skin allergy prick testing.

METHOD

A retrospective study was performed on patients diagnosed as allergic rhinitis and referred for skin allergy testing from January 2008 to January 2012. All patients were tested for an array of common allergens in the region. Patients were not tested if found to have any contraindication. Personal data and clinical history were retrieved from the chart and the results of their test were recorded.

Common Allergens in the Region

Allergen	W	E	Allergen	W	E
Weeds	(1) Mugwort	...	(1) Apple	...	...
	(2) Chenopodium	...	(2)Banana	...	...
	(3) Sorrel	...	(3)Orange	...	...
	(4) Salsola Kali	...	(4)Apricot	...	...
	(5) Alfalfa	...	(5)Kiwi	...	...
	(6) Rough Pigweed	...	(6)Avocado	...	...
Grasses	(7) Grasses	...	(7)Melon	...	...
	(8) Cereals	...	(8)Passion Fruits	...	...
Trees	(9) False Acacia	...	(9)Lemon	...	...
	(10) Cypress	...	(10)Carrot	...	...
	(11) Palm Date	...	(11)Tomato	...	...
	(12) Mesquite	...	(12)Potato	...	...
Animals	(13) Cat	...	(13)Garlic	...	...
	(14) Dog	...	(14)Olive	...	...
	(15) Feather Mix	...	(15)Soya	...	...
	(16) Horse	...	(16)Pepper	...	...
Mites	(17) D. Fainae	...	(17)Curry	...	...
	(18) D. Pteron	...	(18)Cumin	...	...
	(19) Storage Mite	...	(19)Onion	...	...
Insects	(20) Cockroach	...	(20)Coffee	...	...
Moulds	(21) Aspergillus mix	...	(21)Cocoa	...	...
	(22) Penicillium mix	...	(22)Hazelnut	...	...
	(23) Cladosporium	...	(23)Almond	...	...
	(24) Alternaria	...	(24)Walnut	...	...
Latex	(25) Hevea Brasilens	...	(25) Chicken	...	...
E= Erythema measured in mm W= Wheal			(26)Whole egg	...	...
Comments:			(27) Cod	...	...
Controls			(28)Sardine	...	...
Histamine	Negative		(29)Tuna	...	...
			(30)Crab	...	...
			(31)Shrimp	...	...

RESULT

A total of 629 were referred for testing. Twenty-nine patients were not tested because twenty were in age range 0-10 year who refused the test; 9 patients were not tested due to active skin diseases. Six hundred were reviewed, 312 (52%) were females and 288 (48%) were males. Age distribution in the sample under study with positive allergens was almost equally distributed among each decade from 10 to 50 years. A trend of negative results after the age of 50 was observed, see figure 1.

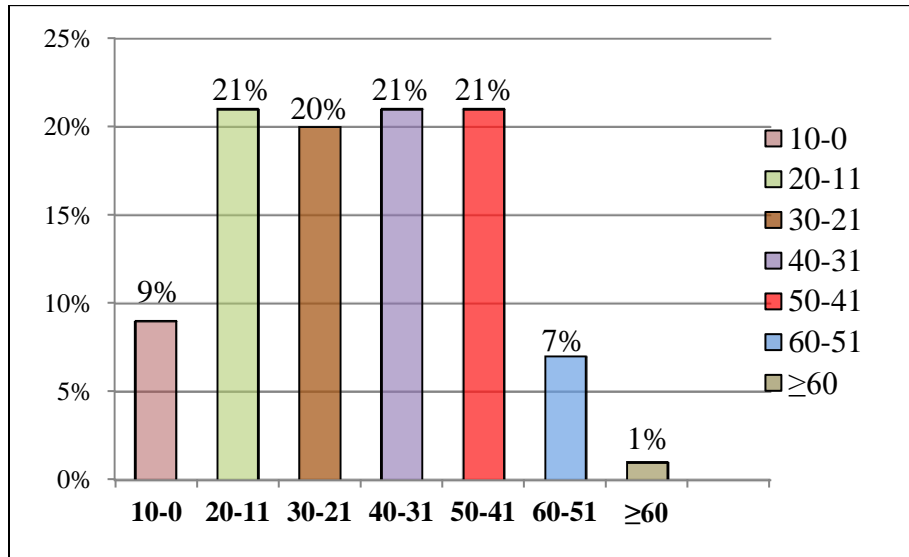


Figure 1: Age Distribution of Patients

Almost half of those tested 288 (48%) were Bahraini. Among the remainder, 312 (52%) were non-Bahraini, 258 (43%) patients were from Gulf countries, 24 (4%) were Asian, and 30 (5%) were Europeans.

Two hundred fifty-eight (43%) patients had other co-morbid allergic diseases, most common was Asthma, 186 (31%). Eczema was the second co-morbid condition in 54 (9%) patients. Eighteen (3%) patients were found to have both asthma and eczema, see figure 2.

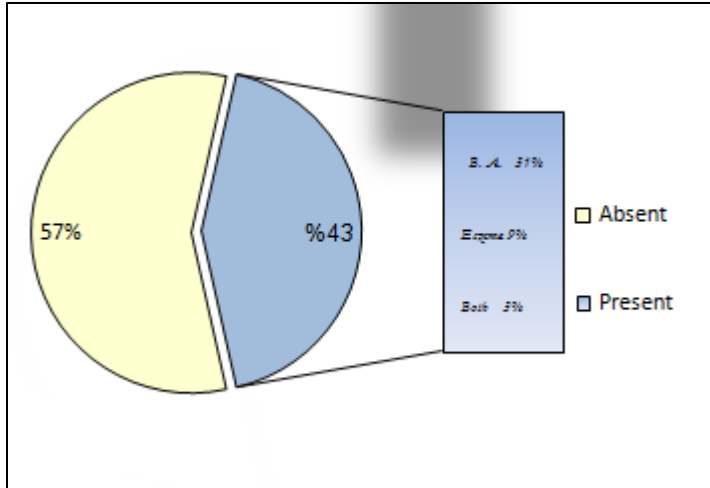


Figure 2: Incidence of Allergic Comorbidities

Two hundred four (34%) patients did not react to any inhaled allergen, 72 (12%) were allergic to a single item. Three hundred twenty-four (54%) were allergic to more than a single inhalant allergen among whom 96 (16%) reacted to two and 66 (11%) reacted to at least 6 inhaled allergens.

Two hundred fifty-two (42%) patients were allergic to weeds, followed by mites, 186 (31%). However, the most common inhaled allergen identified was the house dust mite *Dermatophagoides Pteronyssinus*, 198 (33%) followed by *Salsola kali*, 126 (21%). An overall allergy to house dust mites including storage mites was by far the highest among all other inhaled allergens and was found to affect as much as 318 (53%) of all positive tests, see figure 3.

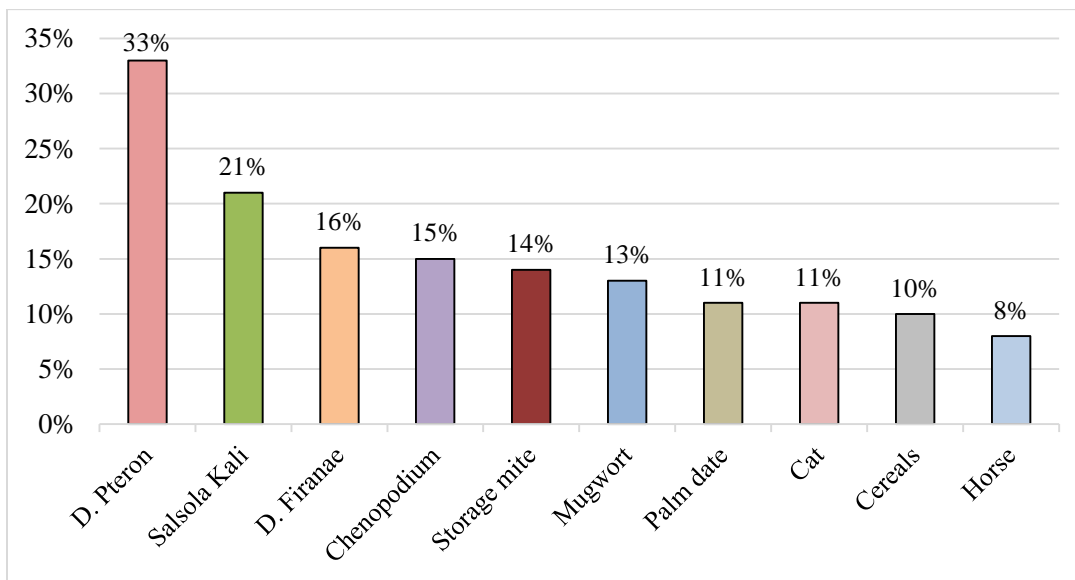


Figure 3: Incidence of Inhalant Allergens

Three hundred seventy-eight (63%) patients did not react to any food allergen tested. Two hundred twenty-two (37%) patients reacted to food allergen, 102 (17%) reacted to a single allergen. Multiple food allergies were not common compared to inhaled allergens because only 72 (12%) were found to have allergies to 3 or more allergens. Walnut was found to be the most offending allergen, 48 (8%) followed by carrot, 36 (6%). Allergy to shrimps was not common, 18 (3%).

DISCUSSION

Nearly one-third of the patients showed no positive sensitivity reactions to inhaled allergens; however, since all patients were clinically diagnosed with allergic rhinitis, they were probably sensitized to other allergens not included in our tests kit.

Most patients were reactive to two or more allergens. Similar findings were obtained from studies in Iran and Kuwait, where polysensitization was found in 76% and 65% patients, respectively¹³. Sensitization to multiple allergens may be due to genetic or environmental factors^{13,14}. This may also be consequent to the cross-reactivity resulting from the presence of common allergic epitopes in related plant species¹⁵.

The most common allergen in this study was *Dermatophagoid pteronyssinus*, a type of dust mite. *Dermatophagoid pteronyssinus* is also known as European house dust mite and *Dermatophagoides firanae* is also known as American House dust mite, they were responsible for sensitization in 39% of patients. *Dermatophagoides pteronyssinus* alone was responsible for 33% whereas *Dermatophagoides firanae* was the offender in 16%. Dust mites survive in all types of climates and are most commonly found in homes where it is found in mattresses, carpets, furniture and bedding¹⁶. Basagaña et al found that the mean attributable fraction of adult asthma due to atopic sensitization was 30% among which 18% was due to dust mites¹⁷.

In this study, Salsola Kali ranked the second most encountered single inhalant allergen in about fifth of subjects, the prevalence is lower than the results in a similar study performed in Oman 34.4%, Saudi Arabia 36.5% and the United Arab Emirates 76.7%¹⁸⁻²⁰. Weed pollen was the most common allergen encountered in a study of allergic rhinitis patients in the Islamic Republic of Iran¹³. All these countries are characterized by a hot and humid climate.

Dust mites were found as the second most common allergen in our study. An overall allergy to trees was found in 18%, while the olive tree pollen was the second most common sensitizing allergen in a study from Italy and it was one of the most common allergens in a study from Turkey^{21,22}. Similar to our study, olive tree pollen was not found to be a significant allergen in studies from the Islamic Republic of Iran, Kuwait, Saudi Arabia and UAE^{13,19,20}. This finding is reflected by the fact that olive trees are not a predominant regional plant.

Animal allergies encountered in our studies were Cats and Horses. Cats are common pet in Bahrain and constitute the most common source of animal allergies too. It is well known that allergy to cats can be a problem even for those who do not own them²³. Allergens from cats are produced in large quantities and cat dander is airborne, sticky and can be found in public places even where there are no cats, which could be explained that the dander is carried on the clothing

of people who have cats which is often shed in public places. Therefore, cat dander is a component of house dust allergens, even in homes where a cat has never lived^{24,25,34}. Most of the studies have found cat dander as a major source of allergen as in our study (11%)³⁵.

It was clearly demonstrated in the tested subjects that the rate of positive testing results dropped as the age of the patients advanced, which is similar to a study done by Broadfield et al²⁶

In this study, we found that many patients are allergic to grass and trees, 15% and 18% respectively. Grass pollens are major source of allergies in Western countries, 7.2% in UK and 23.9% in Germany and 24% in USA^{30,31,32}. Sensitization to grass pollen was found to be 60.1% in Eastern Anatolia, which is far higher than Bahrain³³.

Thirty-one food items were tested including nuts, fruits and sea food. The most common food allergen was walnuts (8%). Both onions and tomatoes has 4% rate of sensitization. Tomato allergies were found to be 9% among the pollen allergic patients in a study²⁷. Tomato allergies have been estimated to range from 1.5% to 16% among food allergic population²⁹.

Eight percent of our patients showed sensitivity to Horse allergen. Allergy to horse has decreased in urban North America compared to early years of this century²⁸. However, the result of our study may be due to still higher horse exposure in Bahrain, which reflects that it is a growing hobby.

CONCLUSION

Morbidities associated with allergies are common in Bahrain. Allergic population in Bahrain is diverse in terms of nature of allergens. Inhalant allergens are more frequently encountered whereas food allergens are less among tested subjects. Weeds, dust mite and animal allergens are most common inhalant allergens. These allergens should be given priority while educating the patients. Allergen identification is an important step in the diagnosis of patients and subsequent management.

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