

Cockroach Allergy: Is It Common in Jeddah City?

A retrospective study

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Abstract

Background: Cockroaches are a common indoor cause of allergic diseases. However, cockroaches are underestimated as a trigger.

Objective: To find which allergic diseases are associated with cockroach sensitization in Jeddah city.

Methods: This is a retrospective paper completed in 2021. The sample group of this paper involved 192 allergic patients with high levels of specific allergy testing (sIgE) to cockroaches. The data for this paper is from a private centre specialising in allergies in Jeddah, Saudi Arabia.

The in vitro tests used were indirect immunoassay tests for the most common indoor allergens. Clinical diagnosis of allergic diseases were also collected. Results were collected via special sheets and tables were extracted.

Results: The sample group for this paper was 192 allergic patients. Patients of middle ages are the most likely to experience sensitisation to cockroaches as follow: 56 between 30-40 years (29.1%) and 36 between 40-50 years (18.8%). The commonest indoor allergens associated with cockroach sensitisation are mites, cats and mould: dermatophagoides pteronyssinus as 109 (56.8%), dermatophagoides farinae as 114 (59.4%), cat as 89 (46.4%) and alternaria as 86 (44.8%). The commonest allergic diseases associated with cockroach sensitisation are allergic rhinosinusitis as 74 (38%), atopic dermatitis as 52 (27%) and asthma as 42 (21.8%). Cockroach sensitisation is mostly of mild severity (under class 2); however, this must be linked to clinical allergic symptoms.

Conclusion: Cockroach sensitisation is most common in the middle aged population(30-50 years). Cockroach sensitisation is commonly associated with other indoor allergens sensitisation (respectively: mites, cats, and alternaria). The commonest allergic diseases associated with cockroach sensitisation are allergic rhinosinusitis, atopic dermatitis, and asthma. Cockroach sensitisation is of mild severity in most of cases (under class 2); however, this must be correlated to a clinical allergic diagnosis.

Keywords: allergic diseases, asthma, allergic rhinitis, atopic dermatitis, atopy, cockroach sensitization, cockroach allergy

Introduction

Sensitization to cockroaches means the presence high sIgEs when exposed to cockroaches. This is type I hypersensitivity reaction (immediate). This means that the inhalation of cockroach allergens can trigger allergic symptoms quickly like allergy rhinosinusitis or asthma. Exposure to cockroach allergens is through nasal mucosa or bronchial epithelium. As cockroaches are typically an indoor allergen, we suspect that they can be associated with other indoors like mites, mould and animals (1).

The four most common cockroach types in Saudi Arabia are German, American, brown-banded and Oriental. The German type is the most common. The most common places where cockroaches are found are kitchens and bathrooms. Kitchens are the most common place (fridge, sink, trash bin, under cabinets). In bathrooms cockroaches are most common in washing machines or in the toilet. Other places where they can be typically found are hotels, restaurants, cafeterias, hospitals, groceries, butcheries, vegetable and fruit shops and bakeries (2).

Cockroach control first starts with an evaluation to be sure if there is infestation or not. Signs of infestation are when you see a cockroach in daylight, and can smell its droppings. The main way to control cockroaches is by using an anti-cockroach spray which is highly effective when used in the correct places. A second method is attracting and catching the cockroaches using a special gel formulation. The third method is by using special adhesive papers in all the suspected areas of infestation (3)

Cockroaches are predominantly indoor insects and that is why they are associated with other indoor allergens. House dust mites are the commonest indoor allergen associated with cockroaches. Other indoors allergens which are associated are mould and animals. In Saudi Arabia cats are the commonest associated pets. Indoor allergens are more common than outdoor allergic reactions, hence their control is crucial for suppressing a chronic inflammatory cascade (4).

Methods

The sample of this retrospective article was 192 allergic patients who were having a high sIgE level to cockroaches. Their ages ranged between 1 to 81 years (111 males, 81 females). The test used to measure sIgE levels to cockroaches was an in-vitro test (blood test). As cockroaches are the source of an indoor inhalant allergen, other indoor allergens were also collected like mites, moulds, and animals. Mites collected were dermatophagoides pteronyssinus and dermatophagoides farina. Moulds were aspergillus fumigatus, alternaria and cladosporium. The cat is the main animal source of indoor allergens in Saudi Arabia.

Associated clinical allergic diagnoses were also collected. This step is crucial to differentiate between atopy and allergy. An allergy is a high sIgE level to certain allergens plus the associated clinical allergic symptoms. Atopy is a high sIgE level to cockroaches without any allergic symptoms (that's why atopy is not important clinically). Allergic diseases identified were allergic conjunctivitis, allergic rhinosinusitis, asthma, eczema, urticaria, angioedema, food allergy, drug allergy and anaphylaxis.

These samples were gathered from the laboratory of an allergy clinic in Jeddah. This allergy centre is private clinic specialising in allergies. Allergy tests which are done routinely for type I hypersensitivity in this clinic are either via an in-vivo skin prick test or an in-vitro RAST blood test. Tests used in this retrospective article were RAST inhalants. Any positive sample for cockroaches was selected first then other variables were extracted after that. Results were recorded in excel sheet and tables were extracted.

Results

192 patients with high sIgE levels to cockroaches participated (111 males, 82 females). The most frequent age range was between 30-40 years (56/ 29.1%). The second most common age was between 40-50 years (36/ 18.8%). The remaining age groups were between 20-30 (26/ 13.5%), 10-20 years (20/ 10.4%), more than 60 (19/ 9.9%), between 50-60 (18/ 9.4%) and below 10 years (17/ 8.9%). These findings indicate that the middle aged patients (30 to 50 years) were the most likely to experience cockroach sensitization. There were 92 (47.8%), so approximately 50% of the total number of cases.

Table 1: Age ranges and distribution of cockroach sensitisation

Age ranges	Number of cases	Percentage
Below than 10 years	17	8.9%
10-20 years	20	10.4%
21-30 years	26	13.5%
31-40 years	56	29.1%
41-50 years	36	18.8%
51-60 years	18	9.4%
More than 60 years	19	9.9%
Total	192	100%

Cockroaches as indoor allergens are usually associated with other indoor allergens. In the study the most common indoor allergen associated with cockroaches were house dust mites, dermatophagoides pteronyssinus for 109 (56.8%) participants and dermatophagoides farinae for 114 (59.4%) participants. The second most common indoor allergens associated were cats for 89 (46.4%) participants and alternaria fungus for 86 (44.8%) participants. The third most common indoor allergens associated were two moulds: aspergillus fumigatus for 76 (39.6%) participants and cladosporium for 70 (36.5%) participants. This mean that although all these indoor allergens are associated with cockroach sensitisation, mites are the most common.

Table 2: % of association level between indoor inhalant allergens and cockroach sensitisation

Allergens	Number of cases	Percentage
Dermatophagoides Pteronyssinus	109	56.8%
Dermatophagoides Farinae	114	59.4%
Cat	89	46.4%
Aspergillus Fumigates	76	39.6%
Cladosporium	70	36.5%
Alternaria	86	44.8%

The key point is to combine cockroach sensitisation results with the clinically associated allergic diseases. The first and most common allergic disease associated with cockroach sensitisation was allergic rhinosinusitis (74/ 38%). The second most common were atopic dermatitis (52/ 27%) and asthma (42/ 21.8%). Other common allergies associated were urticaria and angioedema (30/ 15.6%) and food allergies (21/ 11%). Other allergies are rarely associated.

Table3: % of allergic diseases associated with cockroach sensitisation

Allergic disease	No of cases associated with cockroach sensitisation	Percentage of association
Allergic rhinitis, sinusitis	74	38.5%
Atopic dermatitis	52	27%
Asthma	42	21.8%
Urticaria, angioedema	30	15.6%
Food allergy	21	11
Allergic conjunctivitis	12	6.25%
Contact dermatitis	11	5.73%
Drug allergy	9	4.7%
Anaphylaxis	3	1.6%

Cockroaches and other indoor allergens are mostly of mild severity (under class 2); however, this must be linked to clinical allergic symptoms. This link is crucial because it is not necessary that class severity and clinical severity are matched every time. Sometimes mild class severity is associated with severe clinical symptoms and vice versa. That is why a detailed history is the main key for everything. Mites are the cause of the most severe indoor allergens (DF 2.13, DF 2) and cockroaches are next at 1.9. Other indoor allergens are less severe such as cats 1.64, alternaria 1.5, aspergillus fumigatus 1.16 and cladosporium 1.11. This means that mites and cockroach are the most severe causes of indoor allergens.

Table 4: Severity class level of cockroach and indoor inhalant allergens sensitisation

Allergen	Severity class	% of class 6
Cockroach	1.9	31.7 %
Dermatophagoides pterosaurs	2	33.3 %
Dermatophagoides Farina	2.13	35.5 %
Cat	1.64	27.3 %
Aspergillus fumigates	1.16	19.3 %
Cladosporium	1.11	18.5 %
Alternaria	1.5	25 %

Discussion

Both rhinitis and sinusitis are triggered by cockroach allergen inhalation. Many parts of a cockroach can be inhaled after its death for example its faeces, body secretions, and others. This aeroallergen exposure is common for all ages. Cockroach exposure happens mainly inside low socioeconomic homes, restaurants, and hospitals. The nose is the first line of defense when inhaled cockroach allergens will come in direct contact with nasal epithelial mucosa. These inhaled cockroach parts will trigger a type I hypersensitivity reaction in nasal and sinus mucosa which will be followed by cytokines secretion. Allergic rhinosinusitis symptoms will appear after time if exposure to cockroach allergens continues (5).

Asthma is one of the most common allergic diseases which is linked to cockroach exposure particularly in houses of low socioeconomic populations or in urban areas. Infants' exposure to cockroach increases the incidence of a recurrent wheeze. Cockroach allergens are inhaled

and absorbed through the bronchial epithelium of the respiratory tract. After that, antigen presenting cells will ingest and present cockroach proteins over its surface. This will prime T cells to secrete inflammatory cytokines which will switch on the airway inflammatory process. If exposure to cockroaches continues, airway inflammation will transform into chronic inflammation. Chronic airway inflammation is the base of airway hyperactivities and asthma symptoms (6).

Diagnosis of a cockroach allergy requires a detailed history as a main step. Tests needed are either an in-vitro skin prick test or an in-vivo RAST blood test. To diagnose a cockroach allergy (not sensitisation), we need to combine the history with the test results. A recent advance in diagnosis is the molecular cloning of cockroach protein subtypes (Bla g 1 and Bla g 2). This is called structural biology because it represents the recombinant cockroach allergens. When we determine the subtypes, we will be more able to prescribe specific immunotherapy against it and improve preventative measures (7).

Indoor allergens are commonly associated with each other. House dust mites are the greatest health burden and the most commonly associated with cockroach sensitisation followed by animals and moulds. Exposure to indoor allergens is continuous throughout the year because we spend most of our times indoor (perennial exposure). That is why symptoms of perennial allergic rhinitis are constant throughout the year. This continuous exposure and their possible symptoms are a huge burden on the quality of life. This is opposite to pollens which are outdoors and where exposure to them is largely seasonal (seasonal allergic rhinitis) (8).

The prevalence of indoor allergens is mainly inside homes. In a study in Singapore, these allergens were measured by ELISA both indoors and outdoors and were found to be concentrated indoors. Sleeping mattress, carpets and kitchens were the commonest places where they were found. Furnishings and fabrics also carry large amounts of these allergens. Similar research was completed in Baltimore in 42 homes and gave the same result. This means that a 'gate' for the control of indoor allergens is the control of furnishings and fabrics. If indoor allergens are well controlled, then we can alleviate many allergic symptoms (9).

The most common home place where indoor allergens are concentrated is the bedroom. It's the main location for house dust mites where sources are mainly mattresses, pillows, carpets, and curtains. For moulds, they are present in mainly rooms with high humidity like stores or which have wall leaks or which have had uncleaned air conditioners for a long time. For cockroaches, they are mainly found in kitchens and bathrooms. This insect usually lives in plumbing and sewer pipes. If there is no control, cockroaches will multiply quickly and will be present in large numbers (10).

Does early infancy exposure to indoor allergens induce asthma in later life or not? The answer seems to be controversial. In Sweden a study, shows that there are two significant factors, the presence of a positive family history of allergy plus early indoors exposure. Hence, low level exposure to indoor allergens may cause sensitisation if one parent or both are allergic patients, while low level exposure will not cause any sensitisation in others. However, in another study in Germany, it does not find any relation between the two factors. Nevertheless, it seems that we can advise allergic parents (with a positive family history of allergies) to keep their infants away from indoors allergens, otherwise they are at risk of developing an allergy (11).

Conclusion

Cockroach sensitisation is most common amongst the middle aged (30-50 years). Cockroach sensitisation is commonly associated with other indoor allergen sensitisation (respectively: mites, cats, and alternaria). The most common allergic diseases associated with cockroach sensitisation are allergic rhinosinusitis, atopic dermatitis, and asthma. Cockroach sensitisation is of mild severity in most of cases (under class 2); however, this must be correlated to a clinical allergic diagnosis.

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