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Research Article

Prevalence of Inhaled Allergens among Children with Allergic Airway Diseases in Riyadh Single-Center Experience

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Abstract

Objectives: To identify the prevalence of common inhalant allergens among patients.

Material and Method: This is a cross sectional retrospective observational descriptive study design including 110 patients, who were referred to Asthma and Allergy clinic of children hospital in King Saud Medical City, Riyadh (KSMC) between June 2016 and December 2018 with primary diagnosis air way diseases, eczema and food allergy.

Data Collection and Analysis: Data was collected through questionnaire, checklist and data Based of skin prick test results. The Skin prick test (SPT) procedure was used for all patients as diagnostic of airway allergy and therapeutic as routine intervention tools. The SPT was carried out on the forearm. Any number of allergens can be tested, as few as 3 or 4 or up to about 18 allergens. Clean arm with soap and water or alcohol. The forearm is coded with a skin marker pen corresponding to the number of allergens being tested. A single drop of each allergen extract was applied, two centimeters apart. A small prick through the drop is made to the skin using Stallerpoint plastic needles (Stallergenes, France). A wheal reaction after 15 minutes ≥ 3 mm in diameter more than negative control was regarded as a positive sensitization to that allergen. Antihistamines were discontinued before the SPT was conducted. Glycerinated solutions of histamine phosphate (10 mg/mL) and saline were used as positive and negative controls, respectively. There are some cases exclude from study those of unclear diagnosis, non-reactive skin either used antihistamine or have hyper reactive skin.

The most common indoor and outdoor allergen and the type of plants grown in the area identified. The indoor allergens such as (cats, cockroach, D. Pteronyssinus, etc.) while the outdoor allergens such Russian thistle, Bermuda grass, 12 grasses, molds (*Aspergillus fumigatus, Penicillium mix* and *Alternaria alternara*, etc..) extracts were used to be tested. Data was analyzed through SPSS for windows software, Version 20.0. The level of significance tested by chi square and *P* value <0.05 and 95 con-

fident intervals.

Result: The most common indoor allergens found were the cat dander 39 (25.8%), Cockroach (17%), Dermatophagoides pteronyssinus (15.9%). Among the mold Alternaria and Penicilium mix were same prevalence (11.3%).

Among outdoor allergens, Russian Thistle was the most common (20.5%), followed by Bermuda grass (20%), 12 Grasses (12.5%) and Rye grass (11. 5%). Among trees, Date palm and Mimosa were having same prevalent (5.7%).

Ethical considerations*:* Verbal consent was obtained from parents prior to skin-prick test. This study was approved by IRB committee in KSMC, there is no conflict of interest.

Keywords: Aeroallergens, Allergy, Inhaled allergen, Bronchial asthma, Allergic airway diseases, Saudi arabia, Skin prick test

Introduction

Allergic is a global disease that has increased significantly in the last three decades associated with a dramatic increase in morbidity and mortality among all age groups of population [1,2].

It is triggered or influenced by allergens present in the indoor and outdoor environments. Allergic disorders, such as Bronchial Asthma, allergic rhinitis, atopic dermatitis, food allergy, and drug allergy.

Allergen is an antigen capable of stimulating the production of immunoglobulin E (IgE). Type-I hypersensitivity IgE is an antibody that land over the surface of mast cells, with the re-exposure to the same allergen, mast cells explode and release a lot of inflammatory mediators that can start the allergic cascade [3,4]. A variety of allergens are concerned in the pathogenesis of allergic diseases in different regions all over the world, and some could be indigenous to a particular geographical location [5].

Sensitization to aeroallergens is very common among children with bronchial asthma and allergic rhinitis, and considers the most important risk factor for developing allergic airway diseases, identifying common aeroallergens through skin prick test (SPT). It is beneficial for both patients and the health care system [6] and can Skin prick test can diagnose eczema, allergic rhinitis, allergic conjunctivitis, urticarial, anaphylaxis, eczema and food allergy [7]. Repeating tests sometimes may be important to detect new sensitization, especially in children when new symptoms appear. However, it will help with specific therapeutic intervention and control measures.

Many data were reported from KSA for a pattern of the common aeroallergen sensitization among patients with airway allergy, Allergic rhinitis, and the severity of asthma [8,9]. Koshak conducted a similar study in the city of Jeddah, Saudi Arabia [10].

In our report, we aim to investigate aeroallergens pattern in children with asthma and/or rhinitis in the Riyadh region with a hot desert climate using SPT.

Methodology

This is a cross sectional retrospective observational descriptive study design including paediatric patients, who were referred to Asthma and Allergy clinic of children hospital in King Saud Medical City, Riyadh (KSMC) between June 2016 and December 2018 with primary diagnosis air way diseases, eczema and food allergy. Any patients had comorbidity e.g (Down syndrome, sickle cell disease, cystic fibrosis, primary immunodeficiency were exclude it.

Data was collected through questionnaire, checklist and data Based of skin prick test results attached. The Skin prick test (SPT) procedure was used for all patients as diagnostic of airway allergy and therapeutic as routine intervention tools. The SPT was carried out on the forearm. Any number of allergens can be tested, as few as 3 or 4 or up to about 18 allergens. Clean arm with soap and water or alcohol. The forearm is coded with a skin marker pen corresponding to the number of allergens being tested. A single drop of each allergen extract was applied, two centimetres apart. A small prick through the drop is made to the skin using Staller point plastic needles (Stallergenes, France). A wheal reaction after 15 minutes ≥ 3 mm in diameter more than negative control was regarded as a positive sensitization to that allergen. Antihistamines were discontinued before the SPT was conducted. Glycerinated solutions of histamine phosphate (10 mg/mL) and saline were used as positive and negative controls, respectively. There are some cases exclude from study those of unclear diagnosis, non-reactive skin either used antihistamine or have hyper reactive skin. All patients were in stable condition when the (SPT) carried out at pediatric allergy clinic.

The most common indoor and outdoor allergen and the type of

plants grown in the area identified. The indoor allergens such as (cats, cockroach, D. Pteronyssinus, etc.) while the outdoor allergens such Russian thistle, Bermuda grass, 12 grasses, molds (Aspergillus fumigatus, Penicillium mix and Alternaria alternara, etc..) extracts were used to be tested. Data was analyzed through SPSS for windows software, Version 20.0. The level of significance tested by chi square and P value <0.05 and 95 confident intervals.

Results

The study involved 110 Saudi pediatric patients with airway diseases from each of Asthma and Allergy clinic in KSMC, Riyadh between June 2016 and December 2018.

The mean age was 8.30 and S.D ± 3.40 years, the maximum age was 15 and minimum was 4 months old. Males represented 69.1% of the sample and 30.9% were female. All of them were tested by SPT. More than two thirds 79% of test were positive and more than half 55.5% of SPT done in 2018 (Table 1,2 and Figure 1).

Table 2 shows that the majority of the Common Aeroallergens composition classified into type of category were Grasses 29.14%, followed by Weed 18.0% and Animals 13.49%.

Regarding to the most common allergen which classified into indoor and outdoor. The study shows that the most common prevalent indoor allergen was the Cat fur 25.8%, Cockroach 17.2% and D. pteronyssinus 15.89% (Figure 2). While the most common prevalent outdoor allergen reported in figure 3 were showed Russian thistle 36 was 20.5%, Bermuda grass 20.0% and 12 grasses 15.4%, on the other hand 0.6% only were reported in Sorrel, Yeast mix, False Acacia, and Alfalfa.

The majority of the participant's patients were diagnosed as bronchial asthma (BA) 42.7 %, followed by both bronchial asthmas with allergic rhinitis (AR) 29.0 % (Figure 4). In this study it was found that the year of patient's visit at the clinic was influencing the Skin Prick Test and Gender of Patients such that 2018 have more SPT made to patients with Positive results and the Gender were statically significant (OR= 0.88, CI= 0.20-3.90) compared to the previous years 2016 and 2018 (Table 3 and Figure 5).

Table 4 shows that the bronchial asthma was most common di-

Table 1: The Frequency Distribution of the Year of Patient Visit the Clinic, Gender and Skin Prick Test to the common Aeroallergen: Total Number (N= 110)

Year of Patient Visit the Clinic	Frequency	Percentage
2016	14	12.7
2017	35	31.8
2018	61	55.5
Total	110	100 %
Gender	Frequency	Percentage
Male	76	69.1
Female	34	30.9
Total	110	100 %
Age Group	Frequency	Percentage
4 Month - 5Year	22	20.0%
>5 -10 Year	60	54.5%
>10 Year	28	25.5%
Total	110	100 %

Mean = 8.30 Median = 9.0 Mode = 9.0 Minimum = 4 Month	Std. Deviation ± 3.40 Range =14.60 Maximum = 15Year

SPT	**Frequency**	**Percentage**
Positive	87	79.0 %
Negative	23	21.0 %
Total	110	100 %

Table 2: Frequency Distribution of the Allergen Composition by type of Category.
C = Common Name L= Lateen Name

Allergen	Type	FREQUENCY	Percentage
Grasses 29.14% (95)	C : Alfalfa L: Medicago sativa	4	0.30%
	C: Bermuda grass L: Cynodondactylon	35	10.7%
	C: Johnson grass L: Sorghum halepense	7	2.14%
	C: Timothy grasses L: Phleum pretense	6	1.18%
	C: Rye grass L: Lolium perenne	20	6.13%
Weeds 18% (59)	C: Russian Thistle L :Salsola	36	11.4 %
	C: Rough pigweed L :Amaranthasretroflexus	4	1.2 %
	C: Ragweed L: Artemisia artemisiifolia	2	0.6 %
	C: Mugwort L: Artemisia vulgaris	1	0.30 %
	C: Plantain weeds L: Plantago major	14	4.2 %
	C: Sorrel L: Rumexacetosa	1	0.30 %
Animals 13.49% (44)	C: Dogs L: Canisfamiliaris	2	0.49
	Feather	3	1%
	C: Cat epithelia/hair L: (Felis catus)	39	12%
Dust Mites 13.19% (43)	C: House dust mite L :Dermatophagoides farina	15	4.6%
	C: House dust mite L:Dermatophagoidespteronyssinus	24	7.36%
	Storage mites	4	1.22%
Molds 11.65% (38)	Cladosporium mix	3	1%
	Penicillium mix	17	5.2%
	Alternaria alternate	17	5.2%
	Yeast mix	1	0.30%
Insects 8% (26)	C: Cockroach L: American Periplaneta	26	8%
Trees 6.44% (21)	Mimosa	10	3.6%
	False Acacia	1	0.30%
	Date Palm	10	3.6%

Table 3: The Relationship between the Year of Patient Visit the Clinic with Skin Prick Test and Gender of Patients. Total Number (N= 110)

Year of Patient	visit	N	Gender		Odds	95%
			Male	Female	Ratio	Confidence Interval
2016 SPT	Negative	4	2	2	0.667	0.65- 6.87
	Positive	10	6	4		
Total 12.7%	-14	14	8	6		
2017 SPT	Negative	6	8	1	5	0.54 – 2.11
	Positive	26	16	10		
Total 31.8 %	-35	35	24	11		
2018 SPT	Negative	10	7	3	0.883	0.20-3.90
	Positive	51	37	14		
Total 55.5%	-61	61	44	17		

agnosis in both gender (Male 30.0% (33) & Female 12.7% (14) among all other diagnosis. Statistically, there was no significant relationship between the diagnosis, year of patient's visit to the clinic and gender of patients (P value = 0.65, 0.64, 0.79 Chi-Square =1.61, 1.64, 1.66 and df = 3 ,4) (Table 4).

Discussion

Allergic diseases are considered a great problem all over the world, Awareness of Allergist about the most common Aeroallergen in each city of Saudi Arabia can be regarded an essential utensil for diagnosis, and to define the source of the patient allergy for more preventive measure and the proper management such as immunotherapy.

To the best of our knowledge, this is the first study to be conducted in the pediatric Allergy & Immunology clinic at KSMC, Riyadh.

In our study the majority of our patient asthmatic and 79% of patient tested positive for one or more allergens extract. Of note, the proportion of males in our study was significantly more than half higher than females which correlate with finding in other studies one in eastern region Saudi Arabia [11], another one done in south of Jordan border country to Saudi Arabia [11].

In this study, grass pollens, cat fur, house dust mite and Cockroach were the most frequent allergen in our region.

Saudi Arabia has variable geography with consequent variations in the content of allergens in different geographical regions.

The variability in patient's allergy sensitization has been detected not only among different countries but also among cities within the same nation but different climate area [12].

Distribution of allergens may vary with different geographic areas, local climates, environments and lifestyles [13,14].

Environmental pollution by allergens may be responsible for rising allergic airway disease prevalence in KSA

The most common indoor allergens found were the cat dander 39 (25.8%), Cockroach (17%), Dermatophagoides pteronyssinus (15.9%). Among the mold Alternaria and Penicilium mix were

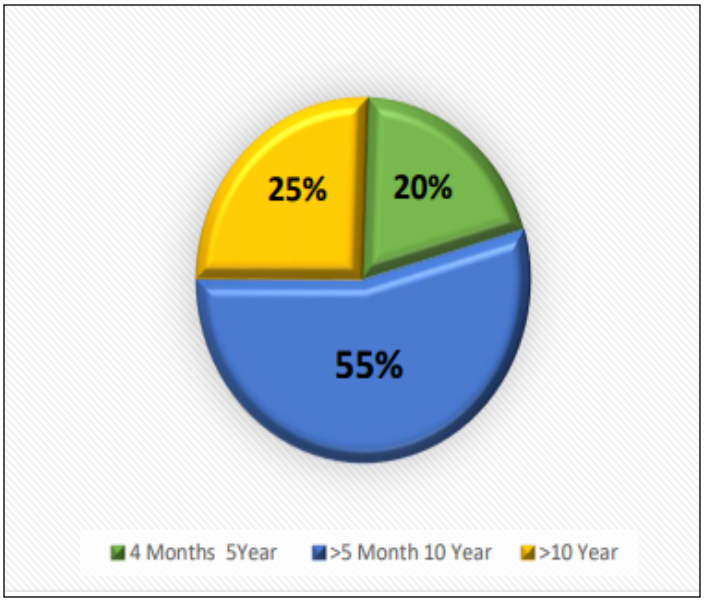

Figure 1: The Age Group of the Patient.

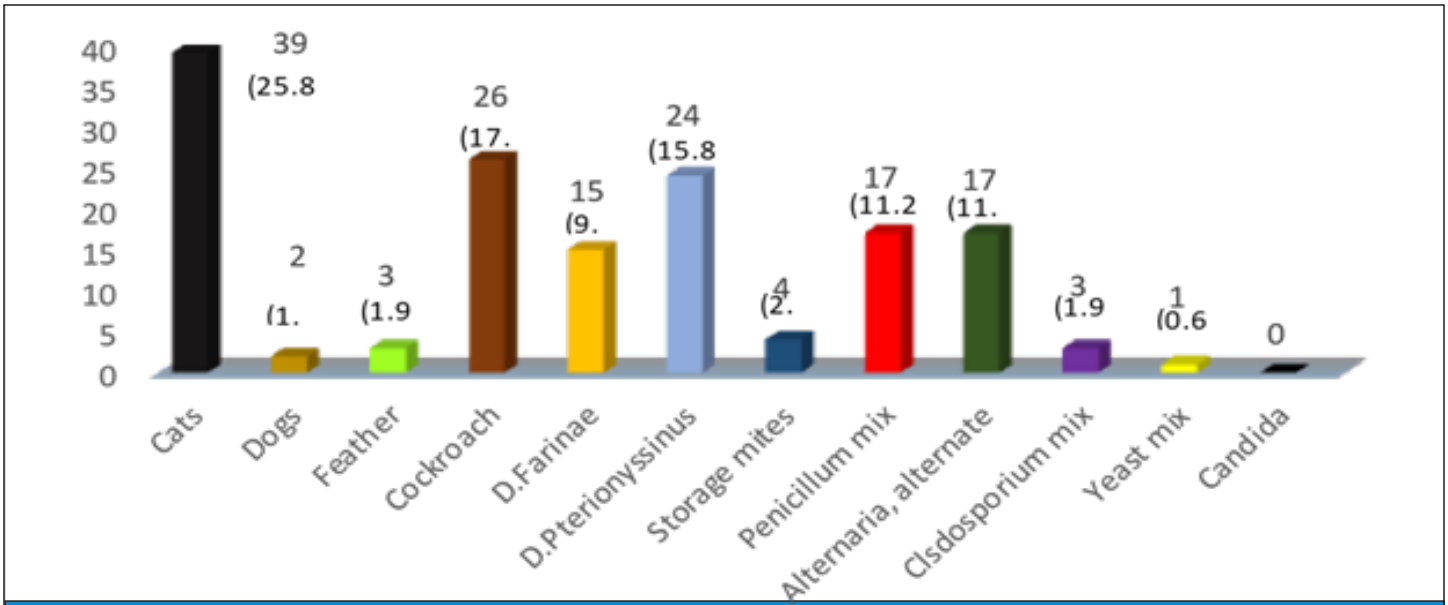

Figure 2: Indoor Aeroallergen Composition.

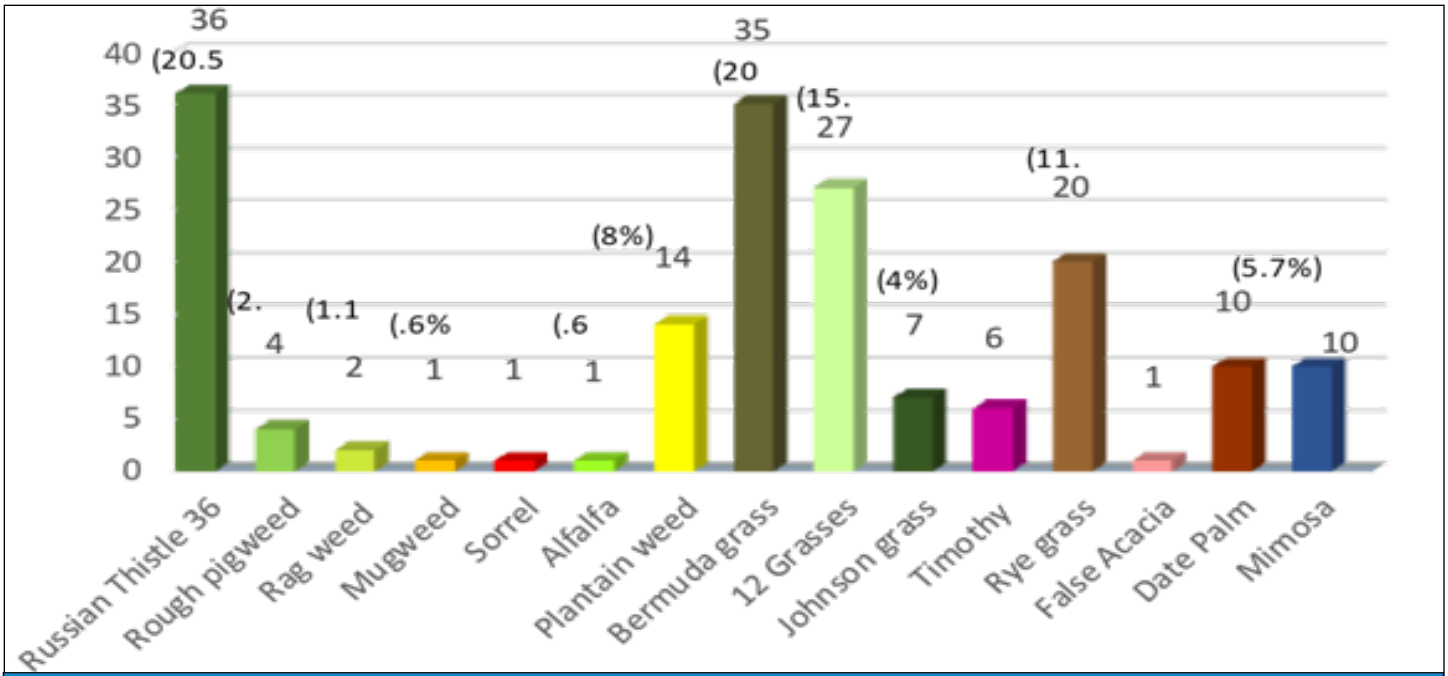

Figure 3: Outdoor Aeroallergen Composition.

same prevalence (11.3%). Among outdoor allergens, Russian Thistle (SALSOLA) was the most common (20.5%) as common in desert and semi desert areas like Riyadh region [15], followed by Bermuda grass (20%),12 Grasses (12.5%) and Rye grass (11.5%). Among trees, Date palm and Mimosa were having same prevalent (5.7%).

Cat allergen is a major source of allergic sensitization worldwide and has been reported 10-15% sensitivity to cat and responsible for rapid onset of respiratory symptoms in cat-sensitized person [16,17] which can develop into a life-threatening condition.

In this study, sensitization to cat allergen is reported as 25.8% of positive skin test result in patients with allergic disease. There was previously reported study conducted in different cities in Saudi Arabia revealed Makkah samples resulted with higher levels of Fel

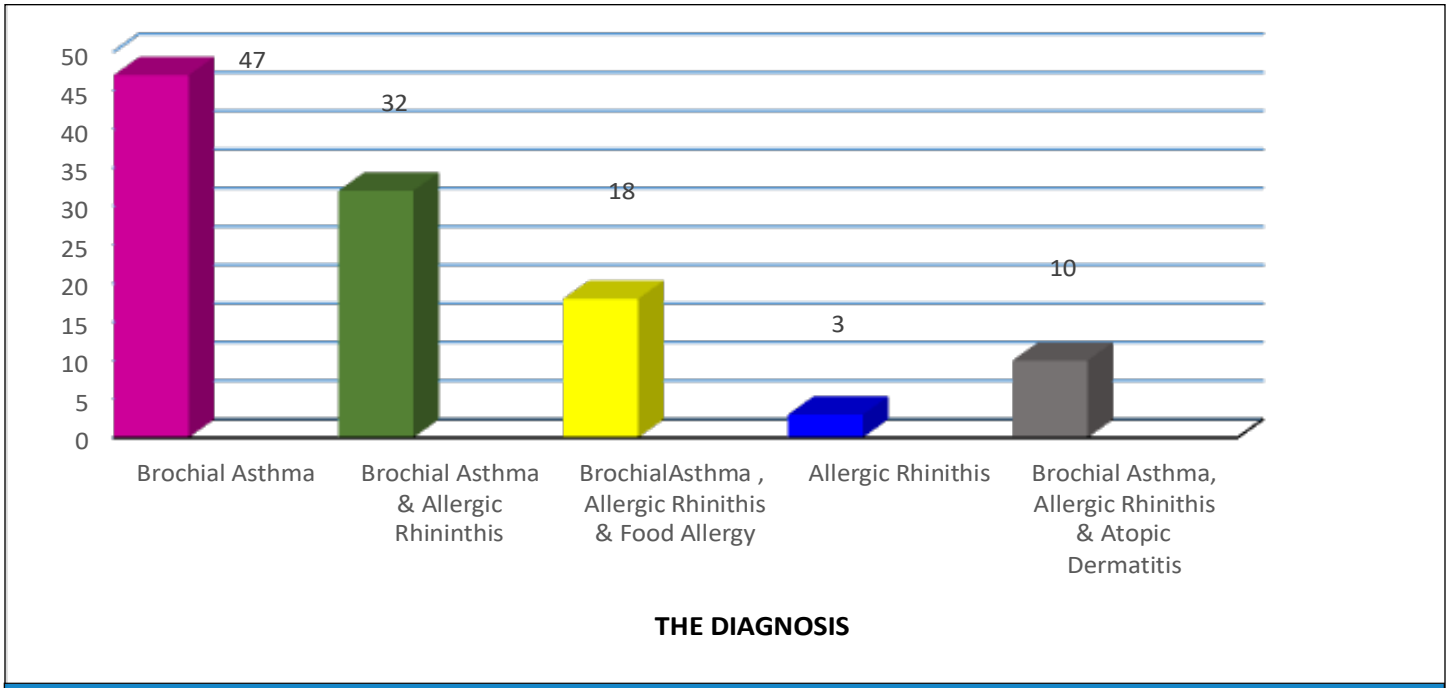

Figure 4: Diagnosis.

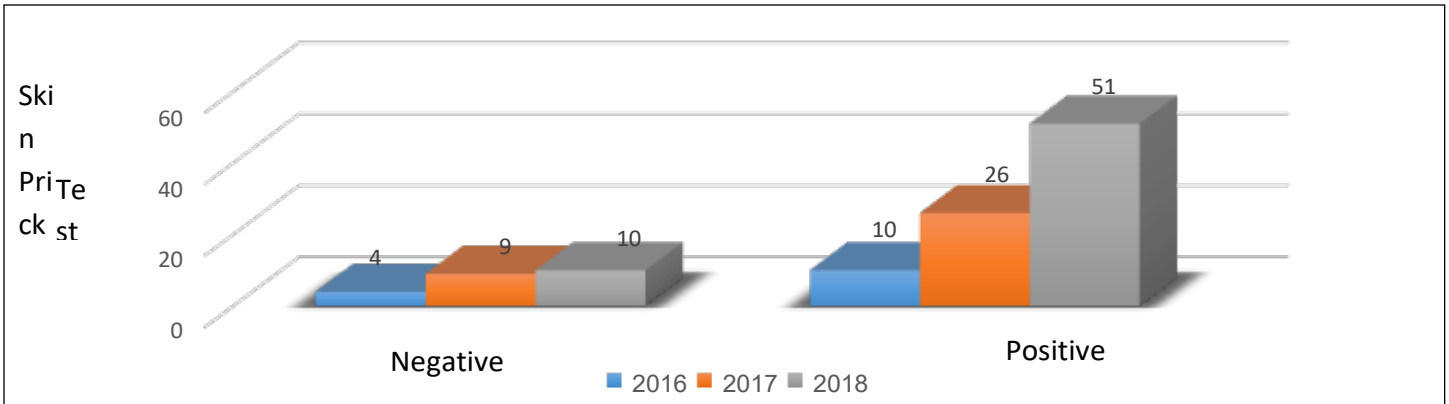

Figure 5: Relationship Between The Spt And The Year Of Visit.

d 1 (12.7%) compared to Riyadh 4.4 % and Jeddah (8%) [10].

However public places and homes without a cat may contain sufficient allergenic protein to induce clinical symptoms in highly sensitized persons [18,19].

Entering an indoor environment that contains a cat and may constitute a relevant risk factor for asthma exacerbations. In some locations, sensitization to cockroach allergen may be as common as cat [20,21].

Another important indoor allergen in our study is Periplaneta Americana (American Cockroach).

Our population exhibited a sensitization rate of 17.2%. Cockroach is significant cause of indoor allergen exposures. Sensitization to cockroach varies across the communities and has been found to be as high as 60% -80% of children with asthma [7,22]. However, sensitization to cockroach allergen may be as common as sensitization to domestic mite allergens and can have a greater effect on asthma morbidity [23].

HDMs are the most common indoor allergens causing allergic airway disease worldwide [24,25]. The most common Aeroallergen identified in our study was HDM (D. pteronyssinus 15.9 % and D. Farina 9.9%). This D.p is the dominant mite in constantly damp climates; D. f survives better in somewhat drier climates.

Table 4: The Relationship between the Year of Patients Visit the Clinic and Gender with Diagnosis.
Total Number (N= 110)

Year of visit & Gender	Diagnosis					Total	Chi-Square	df	P value
	Bronchial Asthma	Bronchial Asthma and Allergic Rhinitis	Bronchial Asthma and Allergic Rhinitis and food Allergy	Allergic Rhinitis	Bronchial Asthma and Allergic Rhinitis & Atopic Dermatitis				
2016							1.61	3	0.65
Male	3	4	1	0	0	8			
Female	2	2	1	0	1	6			
2017							1.64	3	0.64
Male	11 5	9	3	1	0	24			
Female	16	3	3	0	0	11			
Total		12	6	1	0	35			
2018							1.66	4	0.79
Male	19 7	11 3	6	1	7	44			
Female	26	14	4	1	2	17			
Total			10	2	9	61			
Over All Years									
Male	30.0 % (33)	21.8 % (24)	9.0 % (10)	6.3 % (7)	1.8 % (2)	69.1 % (76)			
Female	12.7 % (14)	7.3% (8)	7.3 % (8)	2.8 % (3)	0.9 % (1)	30.9 % (34)			
Total	42.7 % (47)	29.1 % (32)	16.3 % (18)	9.1 % (10)	2.8 % (3)	100% (110)			

Most of the HDM-sensitive patients in Riyadh may have lived in a humid, mite-infested area within the country or abroad. Al-Frayh and colleagues conducted a study to analyse HDM in four regions of Saudi Arabia [26]. This shows the potential impact of mites in patients' allergic disorders, which are not only common but are also increasing in parts of the country

Airborne allergens were identified as risk factors for asthma and other allergic diseases in other Arabian Gulf countries [12,27]. Sensitization is expected to be more than 80% of asthmatic patients in a humid coastal city such as Jeddah [10]. The most common response was to grasses. The Russian Thistle and Bermuda grass which all grow extensively in the Kingdom. While most grass species share many allergens, Bermuda grass has a much more limited allergenic overlap [28].

There were previously reported studies conducted in the Riyadh region and the eastern province of Saudi Arabia with a high level of inhalant allergen sensitization with variable rates of allergen sensitization [29,30].

The amount of mold spores in the air is quite variable and related to the life cycle of local crops, foliage, dead plant particles as well

as seasonal fluctuations in temperature and humidity.

Alternaria and Cladosporium are called (mold aeroallergens). There allergic severity depends on their air exposure levels. In contrast to, candida, aspergillus and Penicillium may trigger allergy even with low air concentration. They may cause serious lung diseases [31].

In our study the mold Alternaria and Penicillium mix were same prevalence (11.3%). Alternaria identified as a major component in the Riyadh outdoor environment, ranging from 1.9%-9% of the total airborne spores isolated [32].

Skin testing of asthmatic children in Riyadh and Makkah revealed relativities to Cladosporium extract of 5.8% and 31.3%, respectively [33].

Conclusion

This work demonstrated that airway diseases and allergic disorders. Patients who were referred to the pediatric allergy clinic at King Saud Medical City, were sensitized to common indoor inhalant allergens. Based on this, study should be offered effective education about the importance of exploring their sensitization to relevant environmental allergens. Subsequently, for better symptom control, health care workers must be encouraged to apply individualized educational strategies for the avoidance of allergens that are clinically relevant for their particular patients. Eventually, this will be of significant help in the overall management of the symptoms.

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Prevalence of inhaled allergens among children with allergic airway diseases in Riyadh single center experiencein Children's Hospital, KSMC Riyadh KSA"

(June 2016- December 2018)

QUESTIONNAIRE

PART I- Clinical Part

Serial No.: _____ **Name of Investigator:** _____
Date of visit: _____ **Month**

Name of Consultant: _____

I. DEMOGRAPHICAL DATA:

Gender: 1. Female ◯ 2. Male ◯

Age: _____ month _____ years

Nationality: 1. Saudi ◯ 2.Non –Saudi ◯

II. EDUCATION

1. Educational level of child:
1. Pre-school child ◯ 2. Student (Grade_____) ◯ 3.others: ____ ◯

2. Educational status of parents:
a. Mother: 1. Illiterate ◯ 2. Undergraduate ◯ 3. University Graduate ◯
b. Father: 1. Illiterate ◯ 2. Undergraduate ◯ 3. University Graduate ◯

c.Residence: 1.Traditional house ◯ 2.Flat ◯ 3. Villa ◯

III. GENERAL QUESTIONS:

1. **Indoor Aeroallergenhistory:**
Do you have animals pet at home?
☐ Yes ☐ No

a.	**Cats**	**:**	Yes ◯	No ◯
b.	**Dog**	**:**	Yes ◯	No ◯
c.	**D.Farinae**	**:**	Yes ◯	No ◯
d.	**Birds**	**:**	Yes ◯	No ◯
e.	**D.Pteronyssinus**	**:**	Yes ◯	No ◯
f.	**Storage mites**	**:**	Yes ◯	No ◯
g.	**Penicillin mix**	**:**	Yes ◯	No ◯
h.	**Alter aria , alternate**	**:**	Yes ◯	No ◯
i.	**Clsdosporium mix**	**:**	Yes ◯	No ◯
j.	**Yeast mix**	**:**	Yes ◯	No ◯
k.	**Candida**	**:**	Yes ◯	No ◯
l.	**Insect (cockroach)**	**:**	Yes ◯	No ◯
m.	**Others**	**:**	_____	

IV. CLINICAL DIAGNOSIS:

I. Diagnosis Of Patients :

- Bronchial Asthma (BA) ◯
- Food allergy ◯
- Allergic Rhinitis: ◯
- Drugs Allergy ◯
- Hypo Gamma Globulinemia ◯
- Eosinophilic Esophagitis (EE) ◯
- Anaphylactic ◯
- Atopic dermatitis

Others : _____

PART II- Practical PartSkin prick test (SPT)Parameters:

I. The Skin prick test?

a. Done: 1.Yes ◯ 2. No ◯

b. skin Practice :

1. Positive ◯ 2. Negative ◯

1. Outdoor AeroallergenHistory: (according to SPT)

a.	Russian Thistle 36:	Ye ◯	No	◯
b.	Rough pigweed:	Yes ◯	No	◯
c.	Rag weed:	Yes ◯	No	◯
d.	Mugweed:	Yes ◯	No	◯
e.	Sorrel:	Yes ◯	No	◯
f.	Alfalfa:	Yes ◯	No	◯
g.	Plantain weed:	Yes ◯	No	◯
h.	Bermuda grass:	Yes ◯	No	◯
i.	12 Grasses:	Yes ◯	No	◯
j.	Johnson grass:	Yes ◯	No	◯
k.	Timothy:	Yes ◯	No	◯
l.	Rye grass:	Yes ◯	No	◯
m.	False Acacia:	Yes ◯	No	◯
n.	Date Palm:	Yes ◯	No	◯
o.	Mimosa:	Yes ◯	No	◯
p.	Others : ----------	◯		◯

Table 4:Composition type of the Allergen Composition by (SPT):

1.	weeds :	Yes ◯	category/type : ----------	No	◯
2.	Grace :	Yes ◯	category/type : ----------	No	◯
3.	Animals :	Yes ◯	category/type : ----------	No	◯
4.	Dust Mites:	Yes ◯	category/type : ----------	No	◯
5.	Insect :	Yes ◯	category/type : ----------	No	◯
6.	Trees :	Yes ◯	category/type : ----------	No	◯
7.	Others	◯ : _____		No	◯

KINGDOM OF SAUDI ARABIA
MINISTRY OF HEALTH

مدينة الملك سعود الطبية
KING SAUD MEDICAL CITY

Hospital: _____ :مستشفى

MRN: _____ :رقم الملف الطبي

NAME: _____ :الاسم

AGE: _____ :العمر **GENDER:** ☐ M F :☐ الـ

NATIONALITY: _____ :الجنسية

DIAGNOSTIC SKIN PRICK TEST

Clinical Diagnosis : B.asthma ☐ AR ☐ dermatitis ☐ food allergy ☐ drug allergy ☐ **Date:**

Family	Description	Diameter	Result
Control	Positive control(HISTAMINE)	> 3mm	
	Negative control (SALINE)	< 3mm	

	Family (Dust mites)	العث المنزلي	Wheal diameter
1	D. farnae	عثة الغبار	
2	D. pteronyssinus	عثة الغبار	
3	Mixed mites	خليط العثة	
	Family (Insects)	**الحشرات**	**Wheal diameter**
4	Mixed cockroach	خليط الصراصير	
5	Cockroach-American	صرصور امريكي	
6	Cockroach-German	صرصور ألماني	
7	Ant. fire	النمل	
8	Mosquito	البعوض	
9	Bees venum	سم النحل	
10	Spider venum	سم العنكبوت	
	Family (Epidermals)	**الحيوانات**	**Wheal diameter**
11	Cat dander	شعر القطط	
12	Sheep dander	شعر الخراف	
13	Feather mix	خليط ريش	
	Family (GRASSes Pollens)	**الحشائش**	**Wheal diameter**
14	Bermuda grass	نبتة التيل/النجيلة	
15	Johnson grass	الذخن المصري	
16	Timothy grass	عصوية	
17	Rye grass	نبتة زوان/الجاودار	
	Family (WEEDs Pollens)	**الأعشاب**	**Wheal diameter**
18	Mix Weed "Artemisia, chenopodium, salsola, plantago"	أعشاب مختلطة	
19	Common ragweed	عشبة الخنازير	
20	Common mugwort	عشبة عادر	
21	Common pigweed	عشبة السندار/الدلاق	
22	Russian thistle = salsola	حرض شائك/الرمث	
23	Plantain English= plantago	اذانالكبش	
24	Chenopodium album	عشبة عقرة/زوربيع	
	Family (TREEs Pollens)	**الأشجار**	**Wheal diameter**
25	Mesquite	شجرة الغاف	
26	Phenix= date palm	شجرة النخيل	
27	Cottonwood eastern	شجرة حور	

	Family (Molds)	القطريات	Wheal diameter
28	Mold mix	خليط قطريات	
29	Candida Albican	قطر المبيضات	
30	AspergillusFumigatus	الرشاشيات الدخناء	
31	Aspergillus Niger	الرشاشيات السوداء	
32	Penicilliumnotatum	قطر البنسيليوم	
33	AlternariaAlternata	نوباء متناوبة	
	Family (foods)	**الأغذية**	**Wheal diameter**
34	Cow's milk	حليب البقر	
35	Goat's milk	حليب الماعز	
36	Egg whole	البيض	
37	Egg white	بياض البيض	
38	Egg yolk	صفار البيض	
39	Fish mix	خليط أسماك	
40	Shellfish mix	خليط القشريات	
41	Chicken meat	الدجاج	
42	Wheat	القمح	
43	Soya bean	فول الصويا	
44	Sesame	السمسم	
45	Strawberry	الفرولة	
46	Banana	الموز	
47	Cocoa bean "chocolate"	الكاكاو /الشوكولاته	
48	Tree nut mix	خليط المكسرات	
49	Peanut	الفول السوداني	
50	Hazel nut	البندق	
51	Brazil nut	جوز برازيلي	
52	Almond	اللوز	
53	Pistachio	الفستق	
54	Cashew	الكاجو	
	Family (others)	**أخرى**	**Wheal diameter**
55	Penicillin	مضاد البنسلين	
56	Latex	اللاتيكس	

Comments: Attending physician:

KING SAUD MEDICAL CITY

CHILDREN'S HOSPITAL

Asthma / Allergy Immunology clinic

List of Patient for Skin Prick Test Monitoring Sheet

SN. NO	Date	MRN	Age	Gender	Nationality	Diagnosis	Skin Prick Test		Name of Consultant	Remarks
							Positive	Negative		
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										
16.										
17.										

Treating Consultant: _____ **Date:** _____