Sultan Qaboos University Medical Journal
November 2008, Volume 8, Issue 3, p. 319-324
Sultan Qaboos University©
Submitted - 26rd February 2008
Accepted - 8th May 2008

CLINICAL AND BASIC RESEARCH

The Pattern of Sensitisation to Inhalant Allergens in Omani Patients with Asthma, Allergic Rhinitis and Rhinoconjunctivitis

*Salem H Al-Tamemi,[1] Azza N Al-Shidhani,[1] Rashid K Al-Abri,[2] Balaji Jothi,[3] Omar A Al-Rawas,[4] Bazdawi M Al-Riyami[4]

نمط التحسيس للمُسْتَأرِجات المستنشقة عند العمانيين المصابين بمرض الربوِ، وحساسية الأنف والعينين

سالم التميمي، عزا الشيذاني، راشد العبري ، بالاجي جوثي، عمر الرواس، بازدوي الريامي

الملخص: الهدف: التعرف على المُسْتَأرِجات النشوقة المهمة المنتشرة في كل بيئة يمكن أن يكون مهما في عملية تشخيص وعلاج أمراض الحساسية. هذه الدراسة تهدف إلى التعرف على نوعية التحسيس للمُسْتَأرِجات النشوقة عند العمانيين المصابين بمرض الربو وحساسية الأنف والعينين. **الطريقة:** تم مراجعة سجلات المرضى الذين أجروا فحص الحساسية خلال ثلاث سنوات متتالية (2004-2006) في مختبر فحص حساسية الجلد في مستشفى جامعة السلطان قابوس والذي تبين أنهم يعانون من الربو وحساسية الأنف والعينين. كما تم استخدام مستخلصات الحساسية من مصنعين مختلفين في فترتين مختلفتين. تم حساب البيانات الموجبة لفحص الحساسية الجلدي لكل مستأرج بيئي مستخدم. **النتائج:** كان عدد المرضى 689 . تم فحص 384 منهم في الفترة الأولى و305 في الفترة الثانية . تراوح العمر بين 5-81 عاما. وكان أكثر عمر تكرر هو 30 سنة. في الفترة الأولى أكثر المُسْتَأرِجات كانت سوس غبار البيت (37.8%) . يليها غبار القش (35.4%). ثم ريش الطيور(33.3%) وصوف الخرفان (26.6%) والغبار المخلوط (25.8%) وشعر القطط 24.2% و الصراصير 22.7% وغبار القصب22.7% و شعر الخيول 17.4% و الذرة (16.1%) . والأعشاب (11.5%) والقطن (10.7 %) والأشجار (10.4%) وشعر البقر (7.8%) والنَّوباءُ المُتَناوِبَة (3.6%) و الرَّشَّاشِيَّةُ السَّوداء (3.4%) و الرَّشَّاشِيَّةُ الدَّخْناء (1.3%). أما في الفترة الثانية كانت أكثر المُسْتَأرِجات سوس غبار البيت أيضا: المُقْتَضِمَةُ المُنْتَسَّة (50.8%). مُقْتَضِمَة الدقيق (47.9%) .شجر الغاف (35.7%) . ثيستل روسي (سالسولا كالي) (34.4%) الصراصير (32.1%) . عشب برمودا (19.7%) . خليط أعشاب (18%) . نبات الحنطة (14.1%) . شعرالقطط (13.8%) . المِكْنَسِيَّةُ المُعَيَّنَة (4.3%) . النوباء الشريطية (3.9%) . الرَّشَّاشِيَّةُ السَّوداء (3.3%) . خليط ريش الطيور (3%) . شعر الكلاب (2.6%) شعر الخيول وقشرته (2.6%) والرشاشية الدخناء (1.6%). **الخلاصة:** طبيعة الحساسية الناجمة عن المُسْتَأرِجات النشوقة البيئية في عمان تبدوا مشابهة لدراسات نشرت في الجزيرة العربية .طرق التعرف على المُسْتَأرِجات النشوقة الخاصة في البيئة وتصنيفها ربما يساعد على تشخيص وعلاج مرضى الربو وحساسية الأنف والعينين.

مفتاح الكلمات: الربو . حساسية . الأنف . العينين . المُسْتَأرِجات, فحص الجلد. سلطنة عمان.

ABSTRACT ***Objective:*** Identification of relevant allergens that are prevalent in each environment which may have diagnostic and therapeutic implications in allergic diseases. This study aimed to identify the pattern of sensitisation to inhalant allergens in Omani patients with asthma, allergic rhinitis and rhinoconjunctivitis. ***Methods:*** The study was carried out during three consecutive years (2004-2006) at the allergy skin test laboratory of Sultan Qaboos University Hospital, Oman. Records of patients who had undergone an allergy skin prick test with a referring diagnosis of asthma, allergic rhinitis or rhinoconjunctivitis were reviewed. Two panels were used during the 3 years period. The frequencies of positive skin tests were analysed. ***Results:*** 689 patients were tested, 384 for the first panel and 305 for the second panel. In the first panel, the commonest positive allergens were: house dust mites (37.8%), hay dust (35.4%), feathers (33.3%), sheep wool (26.6%), mixed threshing dust (25.8%), cat fur (24.2%), cockroach (22.7%), straw dust (22.7%), horse hair (17.4%), maize (16.1%), grasses (11.5%), cotton flock (10.7%), trees (10.4%), cow hair (7.8%), *Alternaria alternata* (3.6%), *Aspergillus Niger* (3.4%), and *Aspergillus fumigatus* (1.3%). In the second panel, the commonest positive allergens were also house dust mites: *Dermatophagoides pteronyssinus* (50.8%), *Dermatophagoides farinae* (47.9%); Mesquite (Prosopis glandulosa) (35.7%), Russian thistle (Salsola kali) (34.4%), cockroach (32.1%), Bermuda grass (Cynodon dactylon) (19.7%), grass mix-five standard (18.0%), wheat cultivate (14.1%), cats (13.8%), *Penicillium notatum* (4.3%), *Alternaria tenius* (3.9%), *Aspergillus Niger* (3.3%), feather mix (3.0%), dog (2.6%), horse hair and dander (2.6%), and *Aspergillus fumigatus* (1.6%). ***Conclusion:*** The pattern of sensitisation to environmental allergens in Oman seems to be similar to other reports from the Arabian Peninsula. Methods to identify and characterise environment specific allergens

Departments of [1]Child Health, [2]Surgery, [3]Clinical Physiology, Sultan Qaboos University Hospital, Muscat, Sultanate of Oman; [4]Department of Medicine, College of Medicine & Health Sciences, Sultan Qaboos University, Muscat, Sultanate of Oman.

**To whom correspondence should be addressed. Email: tamemi@squ.edu.om*

like a pollen survey may help in the management of patients with allergic asthma, allergic rhinitis and rhinoconjunctivitis.

Key words: Asthma; Allergic; Rhinitis; Conjunctivitis; Allergens; Skin tests; Oman.

Advances in Knowledge

- Environmental allergens are well identified and characterised in Western countries, but only a few reports have been published on environmental allergies from the Arabian Peninsula, mainly from Kuwait and Saudi Arabia.
- Each environment may have unique allergens that may contribute to the pathogenesis of allergic diseases.
- This paper highlights the pattern of sensitisation in Omani patients with asthma, allergic rhinitis and rhinoconjunctivitis,
- The common and uncommon allergens are identified for skin testing in Omani patients. This opens up the potential for other allergens to be included in the panel of skin testing.

Application to Patient Care

- Patients should be tested with a panel of allergen extracts that would identify the highest number of sensitising agents that may contribute to their allergic disease; hence measures could be instituted to avoid exposure to the responsible allergens.
- Immunotherapy for allergic diseases is dependent on identifying the sensitising agents.
- This can make postoperative management more specific and result oriented.

Environmental allergens are important immunopathogens that contribute to the pathophysiology of allergic diseases represented mainly by bronchial asthma, allergic rhinitis and rhinoconjuctivitis. It is very important to identify the most relevant allergens in each environment as they differ from one to another. This has diagnostic and therapeutic implications. These patients may benefit from environmental allergen control measures and, where medical therapy is not sufficient to control their symptoms, immunotherapy might be beneficial; hence, the identification of allergens is vital.

Atopy is the tendency of an individual to develop specific IgE against common allergens in the environment. IgE mediates the early phase response of an allergic reaction by involving mast cells as an effecter cell that release chemical mediators which are responsible for the clinical features of an allergic reaction.[1, 2] Asthma is a worldwide problem that affects around 10-15% of all populations. In Omani children, as assessed by ISAAC study, the prevalence rates of reported diagnoses of asthma and allergic rhinitis were higher in older children, 20.7% and 10.5%, compared with 10.5% and 7.4% respectively, in younger children.[3] Asthma is a chronic inflammatory airway disease characterised by the presence of inflammatory cells and cytokines in the airway mucosa that lead to inflammation responsible for the symptoms of asthma. The etiology of asthma is multifactorial, the role of allergy in asthma is well established; for example, there is a strong link between house dust mites (HDM) sensitisation and the development of asthma.[4, 5] Allergic rhinitis is a common medical condition characterised by nasal, throat, and ocular itching; rhinorrhea; sneezing; nasal congestion and, less frequently, coughing. Patients could be sensitised to perennial or seasonal allergens that are present in the environment. Patients with allergic rhinitis may benefit from specific immunotherapy in case medical treatment is insufficient to control their symptoms.[6, 7, 8] There is now evidence supporting a link between asthma and allergic rhinitis which may have therapeutic implications.[9] Most of the experience of environmental allergies comes from the Western hemisphere. There are several studies conducted in neighbouring countries which have shown a different pattern of allergies from the West.[10-15] Little is known about the pattern of environmental allergies in Oman.[16] The aim of this study was to identify the pat-

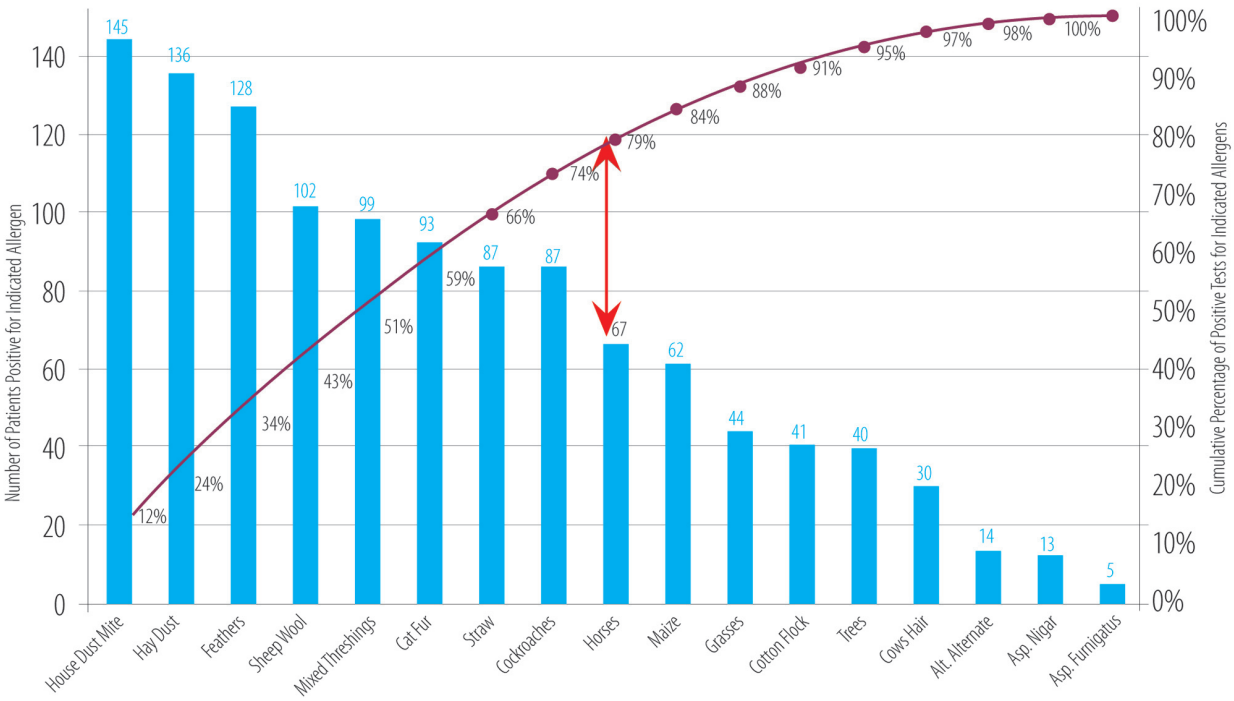

Figure 1: ***Number of patients with positive tests and cumulative percentage of positive tests during the first period***

tern of sensitisation to inhalant allergens in Omani patients with asthma, allergic rhinitis and rhinoconjunctivitis.

METHODS

Medical records of allergy skin tests of patients with a referring diagnosis of asthma, or allergic rhinitis or rhinoconjunctivitis for three consecutive years 2004-2006 were reviewed. The patients had been referred to the allergy skin test laboratory from the pulmonary, ENT, child health, and other clinics at Sultan Qaboos University Hospital (SQUH) and Ministry of Health hospitals in Oman. SQUH is the referral centre for allergy skin testing for the whole country. The allergy laboratory is supervised by pulmonologists and recently by an allergist. Patients consents verbally for the skin prick tests.

There were two panels of extracts used during the three year period, bought from two different companies, and represented by two different graphs in the results. The panel of allergens used consisted of common inhalant allergens believed to be of significance. In the first period, the extracts used were bought from Bencard Company. In the second period, the extracts used were bought from Allergy Laboratories, Inc., USA. Skin prick tests were performed by qualified technicians according to standard method.[17] Disposable Greenlan needles, lancet 23G, were used to prick the skin. Histamine positive control and diluent negative control were used. A skin test was considered positive when a wheal was 3 mm greater than the negative control. Eight patients (7 from the first period and 1 from

Table 1: ***Patient data***

	Number = 689	Percentage %
Age Category		
< 12 years	28	4.1
≥ 12 years	661	95.9
Sex		
Male	314	45.6
Female	375	54.4
Nationality		
Omani	635	92.2
Non-Omani	54	7.8
Referring Clinic		
Chest	264	38.3
ENT	327	47.5
Child Health	9	1.3
Ophthalmology	1	0.1
Other	88	12.8
Diagnosis		
Asthma	271	39.3
Allergic rhinitis	420	61.0
Rhinoconjuctivitis	13	1.9

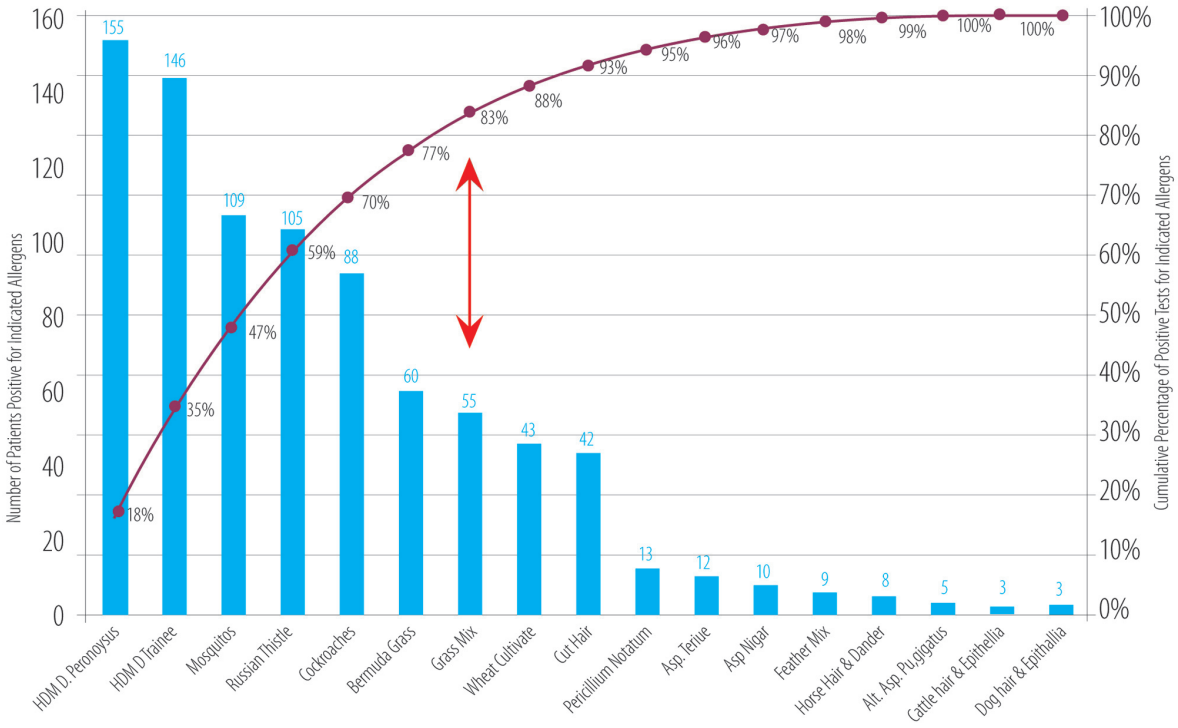

Figure 2: ***Number of patients with positive tests and cumulative percentage of positive tests during the second period***

the second period) were not included in the analysis as they had negative histamine control; none tested positive for negative control.

Using the Statistical Package for the Social Sciences (SPSS), data were entered into two different sheets. For the analysis of baseline characteristics, the data were combined and frequencies were calculated. The two panels of allergens were analysed separately, as they are different and the frequencies were calculated.

RESULTS

There were a total of 689 patients with asthma, allergic rhinitis and rhinoconjuctivitis tested during the study period. A total of 384 were tested for the first panel and 305 for the second panel. The youngest patient was 5 years old and the oldest 81 years old; the median age was 30 years. The majority of patients were referred from the chest and ENT clinics. Of the patients tested, 39.2% had a diagnosis of asthma, 61.3% allergic rhinitis and 1.9% rhinoconjuctivitis. Baseline data are summarised in Table 1.

During the first period [Figure 1], the commonest positive allergen was house dust mites with 37.8% of patients being sensitis ed, hay dust (35.4%), straw dust (22.7%), mixed threshing dust (25.8%), grasses (11.5%) (in 11 cases the extract was not available), trees (10.4%), maize (16.1%), cotton flock (10.7%), animal allergens, sheep wool (26.6%), horse hair (17.4%), cat fur (24.2%), cow hair (7.8%), feathers (33.3%), cockroaches (22.7%) (in 19 cases the extract was not available); mould allergens: *Alternaria alternata* (3.6%), *Aspergillus Niger* (3.4%), and *Aspergillus fumigatus* (1.3%).

During the second period [Figure 2], the commonest positive allergens were also house dust mites: *Dermatophagoides pteronyssinus* (50.8%), *Dermatophagoides farinae (*47.9%); pollen allergens: mesquite (*Prosopis glandulosa)* (35.7%), Russian thistle (*Salsola kali*) (34.4%), Bermuda grass (*Cynodon dactylon*) (19.7%), grass mix-five standard (18.0%) and wheat cultivate (14.1%) [in 2 cases the extracts were not available]; animal allergens: cat (13.8%), dog (2.6%), horse hair and dander (2.6%), feather mix 3.0%; moulds: *Aspergillus Niger (*3.3%), *Aspergillus fumigatus* (1.6%), *Penicillium notatum* (4.3%) [in 11 cases the extract was not available] and *Alternaria tenius* (3.9%) and cockroach (32.1%).

DISCUSSION

In this study, we are able to demonstrate that house dust mites are the commonest sensitisation in Omani patients; half of all patients were sensitised to them which is in agreement with other studies conducted on asthmatic patients elsewhere.[18] About one third of patients were sensitised to mesquite tree and Russian thistle, both common plants in Oman. Grasses contributed to 10% of cases. However, there are other plants in Oman that are potentially allergenic like date palm (*phoenix dactylifera),* a widely planted tree in Oman, for which it may be necessary to test. The families of *Chenopodiaceous* and *Compositae* plants both exist in Oman and may contribute to sensitising agents. Hay dust, straw dust and mixed threshing contributed to about one third in the first period, but these were not individual allergens. One third of patients were sensitised to cockroaches implicating a significant contribution.

In Oman, animals are not often allowed into houses, but sometimes there are domestic cats and dogs that stay around houses and people might get exposed to their allergens. Horses are mainly raised in stables and exposure might be limited to people that work with them. The difference in rate of sensitisation between the two panels could be because of lack of standardised allergen extracts from different manufacturers. Some people raise cattle, goat and sheep in small farms attached to the backyard of their houses. Pigeons are found in Oman; it is not a common practice to keep them inside houses, however exposure to their feathers is still possible as they nest on buildings. There were more patients sensitised to animals and birds in the first period than in the second period. This might be due to variation in allergen extracts because of lack of standardised allergens made by different manufacturers. Goats are raised in Omani farms and sometimes close to houses therefore it might be an important allergen that should be tested in conjunction with sheep. In general, not all patients necessarily need to be tested unless there is a history of exposure or ownership of a certain animal or bird.

Oman is a warm country with a dry weather, except in the coastal area where it may be humid in the summer. Houses are usually exposed to sun all year around and well ventilated, and usually there are no basements. Moulds grow in humid places and are well known to cause allergies; their environmental control might be more amenable than other allergens and immunotherapy is readily available, hence all patients should be tested. In both study periods, they did not contribute significantly in patients tested; however, it might be useful to use mixtures of moulds rather than individual ones to minimise skin pricks and, if immunotherapy is contemplated, individual moulds could then be tested.

CONCLUSION

The pattern of sensitisation to environmental allergens in Oman seems to be more or less similar to other reports published from Arabian Peninsula. Methods to identify and characterise unique allergens through a pollen survey may still be necessary. This will help in the management of patients with asthma and rhinoconjuctivitis who are sensitised to environmental allergens and may benefit from environmental control measures and immunotherapy.

ACKNOWLEDGMENTS

This study was approved by the Institutional Review Board (Scientific & Ethics Committee) of College of Medicine at Sultan Qaboos University

REFERENCES

1. Arshad SH, Karmaus W, Matthews S, Mealy B, Dean T, Frischer T, et al. SPACE study group (Study of Prevention of Allergy in Children of Europe). Association of allergy-related symptoms with sensitisation to common allergens in an adult European population. J Investig Allergol Clin Immunol 2001; 11:94-102.

2. Arshad SH, Tariq SM, Matthews S, Hakim E. Sensitization to common allergens and its association with allergic disorders at age 4 years: a whole population birth cohort study. Pediatrics 2001; 108:E33.

3. Al-Riyami BM, Al-Rawas OA, Al-Riyami AA, Jasim LG, Mohammed AJ. A relatively high prevalence and severity of asthma, allergic rhinitis and atopic eczema in schoolchildren in the Sultanate of Oman. Respirol 2003; 8:69-76.

4. Johnson JR, Wiley RE, Fattouh R, Swirski FK, Gajewska BU, Coyle AJ, et al. Continuous exposure to house dust mite elicits chronic airway inflammation and structural remodeling. Am J Respir Crit Care Med 2004; 169:378-385. Epub Nov 2003.

5. Arshad SH, Hamilton RG, Adkinson NF Jr. Repeated aerosol exposure to small doses of allergen. A model for chronic allergic asthma. Am J Respir Crit Care Med 1998; 157:1900-1906.

6. Hellings PW, Fokkens WJ. Allergic rhinitis and its impact on otorhinolaryngology. Allergy 2006; 61:656-664.

7. Frew AJ, Powell RJ, Corrigan CJ, Durham SR. Efficacy

and safety of specific immunotherapy with SQ allergen extract in treatment-resistant seasonal allergic rhinoconjunctivitis. Allergy Clinic Immunol, 2006; 117:319-325.

8. Varney VA, Tabbah K, Mavroleon G, Frew AJ. Usefulness of specific immunotherapy in patients with severe perennial allergic rhinitis induced by house dust mite: a double-blind, randomized, placebo-controlled trial. Clin Exp Allergy 2003; 33:1076-1082.

9. Sale R, Silvestri M, Battistini E, Defilippi AC, Sabatini F, Pecora S, et al. Nasal inflammation and bronchial reactivity to methacholine in atopic children with respiratory symptoms. Allergy 2003; 58:1171-1175.

10. Al-Dowaisan A, Fakim N, Khan MR, Arifhodzic N, Panicker R, Hanoon A, et al. Salsola pollen as a predominant cause of respiratory allergies in Kuwait. Ann Allergy Asthma Immunol 2004; 92:262-267.

11. Behbehani N, Arifhodzic N, Al-Mousawi M, Marafie S, Ashkanani L, Moussa M, et al. The seasonal variation in allergic rhinitis and its correlation with outdoor allergens in Kuwait. Int Arch Allergy Immunol 2004; 133:164-167. Epub Feb 2004.

12. Al Mousawi M, Behbehani N, Arifhodzic N, Lovel H, Woodcock A, Custovic A. Environmental allergens in Kuwait. Allergy 2001; 56:1237-1238.

13. Ezeamuzie CI, Thomson MS, Al-Ali S, Dowaisan A, Khan M, Hijazi Z. Asthma in the desert: spectrum of the sensitising aeroallergens. Allergy 2000; 55:157-162.

14. Kwaasi AA, Parhar RS, Harfi H, Tipirneni P, Al-Sedairy ST. Major allergens of date palm (Phoenix dactylifera L.) pollen. Identification of IgE-binding components by ELISA and immunoblot analysis. Allergy 1993; 48:511-518.

15. Al-Nahdi M, Al-Quorain AA. Sex distribution and common allergens of bronchial asthma in a Saudi Arabian (eastern province) population. Allergol Immunopathol (Madr) 1987; 15:389-391.

16. Al-Amri M, Al-Rawas OA, Al-Riyami BMS, Richens ER. Atopy in Omani patients with asthma. SQUJ Sci Res Med Sci 2002; 4:15-23.

17. Skin tests used in type I allergy testing position paper. EAACI. Sub-committee on skin tests of the European Academy of Allergology and Clinical Immunology. Allergy 1989; 44:1– 59.

18. Dibek, ME, Reha, CM. Skin prick test results of child patients diagnosed with bronchial asthma. Allergol Immunopathol (Madr) 2007; 35:21-24.