

The Most Common Allergenic Tree Pollen Grains in the Middle East: A Narrative Review

CME Article

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What's Known

- Allergy is a growing burden worldwide. Tree pollens are considered as one the most important sources of allergy. Pollens lead to rhinitis and asthma, especially in cities with ornamental trees in public areas.

What's New

- The commonest tree pollens among the 23 studied countries in the Middle East have been reported.

Abstract

Allergy is becoming a major disease burden globally. Pollens are considered as the main component of aeroallergens that lead to rhinitis and asthma. Due to the lack of a comprehensive investigation on most allergic pollens of trees in the Middle East, the present study aimed to conduct a comprehensive literature review on this topic. The main goal of the study was to provide a checklist for allergists and patients to easily identify the commonest allergic pollens in their locality. The present review provides a broad range of information on the types and geographic locations of the most common allergic pollens of trees in each studied country. In general, among the 23 studied countries, palm and mesquite trees were the common producers of pollen allergen in the Persian Gulf region. Olive tree is common in Turkey, Palestine, and Israel, whereas sycamore tree is the common allergen pollen in Iran. Considering the uneven geographical distribution of these trees in the world, allergists are unable to accurately select the appropriate extracts for the skin prick test based on the information from the neighboring countries. This scenario becomes more complicated if one adds the imported ornamental trees in the picture.

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Introduction

Allergy is the hypersensitive reaction of the immune system of the body to an unknown substance. It follows with symptoms such as itching, allergic rhinitis, red eyes, eczema, hives, or even an asthma attack. The reaction of the immune system to normally harmless materials in the environment is the production of IgE by basophils and mast cells. Among the four types of hypersensitivity, allergy is categorized as type I (immediate) hypersensitivity.^{1,2} The spectrum of manifestations in this inflammatory reaction can range from mildly uncomfortable to dangerous phenomenon,³ such as sensitization to aeroallergens of plants that may be associated with serious morbidity.⁴

There are two general categories of risk factors for allergy, namely patient characteristics and environmental factors. Genetic makeup, age, sex, and race are the most significant factors of patient characteristics. Among environmental factors, exposure to infectious disease during the newborn period and early childhood, and pollutants in the environment are the most important causes.⁵ However, pollens play a major role in the

onset of allergies.⁶ It is approximated that about 40% of allergic patients have been affected by pollens.⁷ On the other hand, global climate change occurs around the world, including the Middle East. A number of studies have shown a significant impact of climate fluctuation on the status of plants of each area and also on aeroallergens and their public and clinical healths.⁸ This reality urges the need for an up-to-date, frequency, and distribution of allergenic tree pollens in each region.

Pollen is a fine powder-like substance released by weeds, scrubs, shrubs, grass, and trees. Wind is one of the main sources of pollen dispersal. Plants pollinated by animals are more frequent. However, in terms of allergy, people are more exposed to pollen dispersed by the wind. Usually, flowers that have brightly colored petals and sugary scents (to attract insects) are less allergic, while the pollens of flowers with drab colors and small flowers without an obvious scent (mainly dispersed by the wind) mostly cause hay fever or allergies.

Specific selection of aeroallergens for the skin prick test by allergists is not always evidence-based.^{9,10} In the medical literature, there is no comprehensive report that describes the global status of allergenic pollens of trees in the Middle East (e.g. plants, distribution and allergenicity of pollen grains, or other plant attributes). The current literature review is aimed to cover the gap and present a checklist on the status of trees and pollens in the region. Herein, we report the allergenic pollens of trees in 23 Middle Eastern countries, including Afghanistan, Azerbaijan, Bahrain, Cyprus, Djibouti, Egypt, Eritrea, Ethiopia, Kuwait, Iran, Iraq, Libya, Oman, Palestine, Israel, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Turkmenistan, United Arab Emirates, and Yemen. It is intended to provide recommendations on aeroallergens of pollens in the Middle Eastern countries to allergists who are often required to give advice to patients that plan traveling to the region. We trust that the included information (e.g. distribution map of allergenic trees and pollens) would be helpful to allergists, health authorities, research scientists, and patients concerned with tree pollen allergies.

The search strategy was developed based on the guidelines of the NHS center for reviews and dissemination (CRD) (<https://www.york.ac.uk/crd/>).¹¹⁻¹⁴ The frequency of reported allergenic tree pollens varied from an adequate number of reports (17 from Iran, 12 from Turkey) to no reports from some countries (Afghanistan and Azerbaijan). A summary of the reported surveys is described below.

Iran

To identify all related published studies, Persian and English databases such as SID, IranMedex, PubMed, Scopus, and ScienceDirect were searched. In total, 17 articles on allergenic tree pollens were identified. Among the 31 provinces in Iran, only 16 (51.6%) provinces covered the topic. Furthermore, some of the reports provided information on a province over different time periods.¹⁵⁻³¹

Positive reaction to tree mix was reported in Mazandaran (50%), Tehran (26%), Fars (data not cited), Sistan and Baluchestan (41.2%), Khorasan-Razavi (24.8%), East Azerbaijan (11.3%), Kermanshah (18.9%), and Karaj (50%). As shown in table 1, the most common allergic pollens were Mesquite, Ash, Acacia, Eucalyptus, Cedar, Sycamore, Maple, Fraxinus excelsior, Pinus, Birch, Hazel, Alder, Pine, Elm, Plane tree, Olive, Botrytis, Salicaceae, Frene, Salix babylonica, and Ailanthus altissima. For convenience, common and scientific names of the relevant trees are provided in table 2.

The review of reported aeroallergens of pollens shows that most current studies from Iran were during 2003 to 2014. Although the geographical distribution of reports does not show a certain pattern, most are related to the western provinces of Iran (figure 1). The most commonly studied trees were 8 reports on White or European Ash (*Fraxinus Americana* and *excelsior*); 5 reports on Sycamore (*Platanus orientalis*); 4 reports on Birch (*Betula betulaceae*), Oak (*Quercus robur*), and Pinus (*Pinus pinaceae*); 3 reports on Elam (*Ulmus ulmaceae*) and Olive (*Oleaceae*); 2 reports on Maple (*Acer pseudoplatanus*), Willow (*Salicaceae*), Mesquite (*Prosopis julifera*), Eucalyptus (*Eucalyptus globulus*), and Hazel (*Alnus serrulata*); and 1 report on Weeping willow (*Salix babylonica*), Beach (*Fagaceae*), and Cedar (*Cupressus sempervirens*).

A synthesis of reported contributions showed that the most allergenic tree pollens according to the current reports were White or European Ash (min. 6%, max. 53.5%, mean 29.1%), Sycamore (min. 1%, max. 57%, mean 25%), Birch (min. 4%, max. 7.6%, mean 5.2%), Oak (min. 1%, max. 16.3%, mean 6.1%), Pine (min. 1%, max. 9.6%, mean 3.8%), Elm (min. 3%, max. 3%, mean 3%), Maple (3%), Willow (min. 8.3%, max. 13.5%, mean 10.9%), Olive (min. 9.6%, max. 22%, mean 15.8%), Mesquite (min. 65.1%, max. 65.9%, mean 65.5%), Eucalyptus (min. 21%, max. 21.7%, mean 21.3%), Hazel (5%), Weeping (37%), Beach (3.8%), and Cedar (27%). The cited percentages for each tree depict the frequency of allergy to tree pollens among the studied groups.

Table 1: The list of published papers on tree pollens aeroallergens based on the prick test in Iran with relevant details before November 2015

Authors	Year of publication	Year of study	Sample size	Province	Reported allergic pollens (%)
Ahmadi-fshar ¹⁵	2008	2003-2005	164	Zanjan	Olive (22%), Salicaceae (13.5%), Ash (20%)
Hedayat ¹⁶	2000	1998	1,077	Isfahan	Salix babylonica (37%), Fraxinus excelsior (26%), Platanus orientalis (23%), Ailanthus altissima (14%)
Assarehzadegan ¹⁷	2013	2010-2011	299	Ahwaz	Mesquite (Prosopis Juliflora) (65.9%), Acacia (Acacia longifolia) (48.2%), Eucalyptus (Eucalyptus globulus) (21.7%), White Ash (Fraxinus Americana) (52.5%)
Behmanesh ¹⁸	2010	2008-2009	133	Mashhad	Tree mix (24.8%)
Bonyadi ¹⁹	2014	2010-2012	150	Tabriz	Street trees (11.33%)
Farhoudi ²⁰	2005	2002-2003	226	Karaj	Tree mix (50%), Ash (40%), Cedar (27%), Sycamore (57%)
Fereidouni ²¹	2009	2006	356	Khorasan Razavi	Fraxinus americana (53.5%), Pine (9.6%)
Fouladseresh ²²	2014	2007-2010	157	Kerman	Salicaceae (8.3%), Fagaceae (3.8%), Oleaceae (9.6%), Betulaceae (7.6%)
Ghaffari ²³	2010	2006-2007	375	Mazandaran	Maple (3%), Oak (1%), Fraxinus excelsior (6%), Birch (4%), Ulmus (3%), Pine (1%), Platanus orientalis (1%)
Ghaffari ²⁴	2012	2006-2009	375	Sari	Tree mix (3%), Platanus orientalis (1%), Oak (1%), Maple (3%), Hazel (Alnus serrulata) (5%), Fraxinus excelsior (6%), Ulmus ulmaceae (3%), Pine (1%), Birch (4%)
Hosseini ²⁵	2014	2006-2009	313	Tehran	Tree mix (26%)
Kashef ²⁶	2003	2001-2002	212	Shiraz	Acacia, Ash, Birch, Hazel, Oak, Elm, Pine, Plane tree
Nabavizadeh ²⁷	2013	2011-2014	184	Yasouj	Oak (16.3%), Tree mix (18.9%)
Shakurnia ²⁸	2012	2010	354	Ahwaz	Prosopis juliflora (65.1%), Eucalyptus (21%)
Khazaei ²⁹	2003	1996-2003	1,286	Sistan-Balouchestan	Tree mix (41.2%)
Mohammadi ³⁰	2008	2005-2007	206	Tehran	Tree mix
Pazouki ³¹	2008	2008	19	Mashhad	Platanus orientalis (43%)

Other Middle Eastern Countries

As shown in figure 2, among the 23 Middle Eastern countries, 8,071 article titles were observed, 181 abstracts read, 87 full-text articles studied, and eventually, 36 articles were selected. The distribution of the selected articles per country in terms of the number of reports, the most important allergenic tree pollens, and frequency of their allergenicity is described below.

- Cyprus: 2 reports; Acacia (29.4%) and Olive (23.7%).^{32,33}
- Egypt: 1 report, Olive (12.5%).³⁴
- Kuwait: 1 report; Eucalyptus (42.9%), Cajuput (53.5%), and Palm (39.6%).³⁵
- Oman: 2 reports; Prosopis juliflora (10.4%), Queen palm and Cupressus (7%), and Willow (0.5%).^{36,37}
- Pakistan: 2 reports; Morus alba (7%), Qatar the Beach (0.4%), Birch (1.1%), White mulberry (1.4%), Cypress (0.4%), and Olive (1.4%).^{38,39}

- Palestine and Israel: 8 reports; Olive (37.2%), Pistacia (29%), Cedar (29.4%), and Pecan (30.3%).⁴⁰⁻⁴⁷
- Qatar: 1 report; Fagaceae (0.4%), Betulaceae (1.1%), Mulberry white tree (1.4%), Cypress (0.4%), Oleaceae (1.4%), Salicaceae (0.5%), and Tree mix (2.1%).⁴⁸
- Saudi Arabia: 6 reports; Mesquite (42.3%), Palm (40%), Olive (35.8%), and Acacia (17%).⁴⁹⁻⁵⁴
- Turkey: 12 reports; Birch (23.4%), Beach (22.5%), Olive (30.2%), Acer (14.2%), Sycamore (20.3%), Oak (19.9%), Pine (8.2%), Pussy willow (16%), Elm (18%), Alder (19.1%), White mulberry (19.8%), Hazel (19.5%) and Horse chestnut (57.4%).⁵⁵⁻⁶⁷
- United Arab Emirates: 2 reports; Ricinus communis (6.3%)⁵³ and (23.5%),⁶⁷ Prosopis juliflora (12.6%)⁵³ and (12%).⁶⁷

As indicated in table 3, there were no reports from Afghanistan, Azerbaijan, Bahrain, Djibouti,

Table 2: The common and scientific names of reported trees with allergen pollens in the Middle East

Common name	Binomial name
Mesquite	Prosopis juliflora
Acaci	Acacia longifolia
Eucalyptus	Eucalyptus globulus
White ash	Fraxinus Americana
Cedar	Cupressus sempervirens
Sycamore	Platanus orientalis
Oak	Quercus robur
Maple or Acer	Acer pseudoplatanus
Hazel	Alnus serrulata
Elm	Ulmus ulmaceae
Pinus	Pinus pinaceae
Birch	Betula betulaceae
Olive	Olea europaea
Willow	Salicaceae
Beach	Fagaceae
European ash	Fraxinus excelsior
Tree of heaven	Ailanthus altissima
Weeping willow	Salix babylonica
Cajeput tree	Melaleuca cajuputi
White mulberry	Morus alba
Queen palm or cocos palm	Syagrus romanzoffiana
Pecan	Carya illinoensis
Alder	Alnus glutinosa
Pussy willow or goat willow	Salix caprea
Horse chest	Aesculus x carnea

Eritrea, Ethiopia, Iraq, Libyan, Somalia, Sudan, Syrian, Turkmenistan, and Yemen.

Discussion

Awareness of airborne pollens in each country and region can be regarded a necessity due to increasing mobility for leisure time and business activities.⁶⁸

On the other hand, it is becoming clear that allergenic tree species may be considered as a problem within subtropical climate zones.⁶⁸ It has been shown that in some types of trees, pollen grains can exacerbate respiratory symptoms in allergic patients and result in hospitalization.^{69,70}

Commercially, there are about more than 200 pollen grains, extracts of allergens for trees, grass, and weeds that are distributed by vendors worldwide.⁷¹

These extracts of allergens are used in the diagnosis of allergic disorders in prick tests and immunotherapy.⁷⁰ A selection of extracts for the skin prick test is done according to clinical data, regional distribution of plants, inter alia, season, regional distribution, and flowering cycles. Awareness of common aeroallergens of pollens in each area can assist allergists in choosing the most suitable allergens for the prick test and immunotherapy, as well as to address the



Figure 1: A schematic map illustrating various provinces of Iran with and without a report of aeroallergen pollens with common type in each region before January 2015.



Figure 2: The Middle Eastern countries tagged with the number(s) of reported reference(s) of allergenic pollens. NR: Not reported.

Table 3: The list of published papers on pollens of trees in countries located in the Middle East based on prick test before November 2015

Authors	Year of publication	Year of study	Sample size	Country province	Reported allergic pollens (%)
Dalkan et al. ³⁷	2014	2010	97	Cyprus Nicosia	Acacia dealbata (29.4%), Olea europaea (23.7%)
Priftis et al. ³⁸	2007	1996-1999	1,038	Cyprus Maroussi, Aliartos	Olea europaea (N)
Elshabrawy et al. ³⁹	2014	2012	96	Egypt Qassim	Olea europaea (12.5%)
Ezeamuzie et al. ⁴⁰	2000	1997-1998	553	Kuwait	Cajuput tree (53.5%), Eucalyptus tree (42.9%), Phoenix dactylifera 39.6%
Al-Tamemi ⁴¹	2008	2004-2006	384	Oman	Prosopis juliflora (10.4%)
Al-Amiri et al. ⁴²	2002	N	71	Oman	Queen palm and Cupressus trees (7%)
Ahmad et al. ⁴³	2011	N	650,067	Pakistan	Sensitive to pollens has been reported only (58.9%)
Abbas et al. ⁴⁴	2012	2005-2007	1,000	Pakistan	Morus alba (7%)
Sharif El et al. ⁴⁵	2003	2000-2001	273	Palestine	Olea europaea, Betula verrucosa, Alnus glutinosa, Corylus avellana trees (N%)
Keynan et al. ⁴⁶	1997	N	216	Israel	Pistacia vera (31.5%), Pistacia atlantic (29.9%), Pistacia lentiscus (30.3%), Pistacia Plastina (24.6%)
Geller-Bernstein et al. ⁴⁷	1996	N	1,573 Jews 90 Arab	Israel Sardinia	Olea europaea (40% in Jews and 16% in Arab)
Bibi et al. ⁴⁸	2002	1998	448	Israel Ash, kelo	Olea europaea (28.1%), Cupressus sempervirens (28.1%)
Geller-Bernstein et al. ⁴⁹	2002	N	86	Israel Shearam	Olea europaea (21%)
Tamir et al. ⁵⁰	1991	N	19	Israel	Olea europaea (100%)*
Graif et al. ⁵¹	2006	N	127	Israel	Olea europaea, Cttpressus sctnpervirtis, Carya illinocsis (49%)**

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Table 3: (Continued)

Authors	Year of publication	Year of study	Sample size	Country province	Reported allergic pollens (%)
Rachmihl et al. ⁵²	1996	N	395	Israel Netzer, Tzireni	Carya illinocsis (11.6%), Cupressus sempervirens (11.1%), Phoenix dactylifera (6.3%), Olea europaea (6.3%)
Sattar et al. ⁵³	2003	2001-2003	1,106	Qatar Doha	Fagaceae (0.4%), Betulaceae (1.1%), Mulberry white tree (1.4%), Cypress (0.4%), Oleaceae (1.4%), Salicaceae (0.5%), Tree mix (2.1%)
Almogren ⁵⁴	2009	2003-2004	139	Saudi Arabia Riyadh	Prosopis juliflora (72.1%), Phoenix dactylifera (23%)
Harfi et al. ⁵⁵	1992	N	60	Saudi Arabia	Phoenix dactylifera (25%)
Al-Frayeh et al. ⁵⁶	1999	1995-1996	420	Saudi Arabia Abha, Qassim, Hofuf, Gizan	Prosopis juliflora (38.8%), Olea europaea (35.8%),
Suliaman et al. ⁵⁷	1997	1992-1994	806	Saudi Arabia	Mesquite 46%, Acacia 29%
Hasnain et al. ⁵⁸	2012	N	492	Saudi Arabia, United Arab Emirates, Sudan	Ricinus communis (6.3%), Prosopis juliflora (12.6%), Phoenix dactylifera (12%)
Al-Frayh et al. ⁵⁹	1992	N	240	Saudi Arabia Riyadh, Mecca	Acacia SP (5% and 17%), Salix caprea (5% and 9%)
Geçer et al. ⁶⁰	2012	N	100	Turkey	Betulaceae (alder, birch, hazel, hornbeam) N%, Salicaceae (poplar, willow) N%
Aydin et al. ⁶¹	2009	2002-2006	1,552	Turkey Istanbul	Betulaceae (23.5%), Fagaceae (19.4%)
Can IH et al. ⁶²	2010	2007-2008	43	Turkey	Acer (3%), Betulaceae (18.1%), Oleaceae (4.5%), Salicaceae (3%), Fagaceae (25.7%)
Senol M et al. ⁶³	2006	N	246	Turkey	Tree mix-1 (13%), Tree mix-2 (12%)≤
Gokmen et al. ⁶⁴	2012	N	437	Turkey	Olea europaea (48.5%)
Sin et al. ⁶⁵	2008	2003-2004	455	Turkey	Cupressus sempervirens (14.3%)
Dursun et al. ⁶⁶	2008	2004	54	Turkey Ankara	Olea oleaceae (olive) (59.2%), Pinaceae (14.5%), Acer (25.5%), Populus (21.5%), Oak quercus (14.5%), Betula (18.2%), Salix (16.4%), Fraxinus (20%), Ulmus (18.2%), Aesculus (horse chestnut) (57.4%), Tilia (linden) (42.5%), Platanus (plane) (29.6%)
Tezcan et al. ⁶⁷	2003	1994-2001	5,055	Turkey Izmir	Alnus glutinosa, Corylus avellana, Populus alba, Ulmus scabra, Salix caprea, (overall 14%)
Yazicioglu et al. ⁶⁸	2004	2000-2002	539	Turkey Trakya	Olea europaea (8.9%), Corylus avellana (8.3%), Fraxinus excelsior (8.3%), Salix caprea (7.2%), Alnus glutinosa (5.9%), Populus alba (5.8%), Quercus robur (3.8%), Juglans regia (5%), Ulmus campestris (3.5%), Pinus sylvestris (2%), Platanus vulgaris (3.8%), Tilia platyphyllos (2.8%)

(Contd...)

Table 3: (Continued)

Authors	Year of publication	Year of study	Sample size	Country province	Reported allergic pollens (%)
Erkara et al. ⁶⁹	2009	2000-2001	130	Turkey	Alnus glutinosa (32.3%), Corylus avellana (30.8%), Populus alba (32.3%), Ulmus scabra (32.3%), Salix caprea (24.6%), Betula verrucosa (33.8%), Fagus sylvatica (26.2%), Quercus robur (41.5%), Platanus orientalis (27.7%)
Misirlioğlu et al. ⁷⁰	2007	1995-2000	539	Turkey Ankara	Betulaceae, Moist zone frees, Park tree pollens, Fagaceae, Eastern trees, Mediterranean trees (overall 16.5%)
Cavkaytar et al. ⁷¹	2015	2013	318	Turkey	Robinia pseudoacacia (9.7%), Cupressus arizonica (7.5%), Tilia platyphyllos (6.3%), Alnus glutinosa (0.3%)
Lestringant et al. ⁷²	1999	N	263	United Arab Emirates	Prosopis juliflora (23.5%)

^NNot determined, ^{*}Skin prick test has been done on selected community and has not been done on the general population, ^{**}Positive skin prick test for at least one tree pollen, [†]Tree mix-1: Willow, beech, maple, black mulberry, lime-tree, juniper, pine. Tree mix-2: Betula pendula, olive tree, poplar, peanut, oat, black alder, white ash. Cypress: Cupressus sempervirens, Olive: Olea europaea, Palm: Phoenix dactylifera, Pecan: Carya illinocsis, Mesquite tree: Prosopis juliflora, Castor bean: Ricinus communis

source of the patient's allergy better. In addition, prevention and better treatment options can reduce the financial burden allergies placed on the healthcare services.

In central, north, west, and Eastern Europe, birch (*Betula*) has been reported as the most allergenic tree pollen grains in the months of June and July. While in central Alpine regions, pollen grains of *Alnus viridis* are common in the months of May and June.⁷¹ The Middle East is a transcontinental region centered in Western Asia and Northeast Africa (figure 2), where that climate is dry in summers and mild in the winters. This fact has caused special vegetation with various types of allergenic pollen that are different from allergenic pollens in Europe.⁶⁸ The largest ethnic populations in the region include Arabs, Azeri, Persians, Kurds, and Turks. The climate of the Middle East is usually dry, although winters are mild with rain. According to the current literature review, we could not find any reports for allergic pollens of trees for 13 countries in the Middle East (56.5%). This may be due to our unfamiliarity with the local languages such as Arabic and Turkish and/or because such articles have only been published in domestic journals in local languages. Moreover, it seems that countries with lower economic status have few publications in the field of allergens whereas more contributions are found in PubMed from countries with a better economic ranking. The coverage of domestic trees varies in each area of the Middle East while palm and mesquite

trees are common in countries located in the Persian Gulf area, olive is common in Palestine, Israel, and Turkey, and sycamore in Iran. The diversity of reported allergenic pollens in different areas of some countries should be taken into consideration and creating a panel of allergen extracts for the skin prick test that is decision-based according to locally reported allergic pollens can be more effective in the treatment of type I allergies. Furthermore, it is particularly notable that with an increasingly common practice of planting imported ornamental trees in public parks, highways, and streets, special attention should be paid to these new sources of pollens.

Iran is a large territory situated between the Persian Gulf and the Caspian Sea in western Asia, and its 1,648,195 km² area has a changeable climate. According to FAO reports, about 7% of the country is covered by forests. The forest slopes rising from the Caspian Sea are mostly covered with ash, oak, elm, and cypress, and at the same time, the central and western parts of the country are predominately covered with oak. However, the country has mostly semi-desert areas.⁷² This pattern of vegetation coverage emphasizes the necessity of separately identifying domestic pollen grains aeroallergens in each region. The current review has shown that there are different types of allergic pollens in many Iranian provinces and areas; this needs to be investigated thoroughly. Although the reported allergic pollens in some

provinces are vague and need to be addressed in detail (figure 1), we should keep in mind that due to the special types of trees that are growing in specific climates, reported common allergic pollens of neighboring areas in the country may not accurately represent the adjacent geographical area.

The present literature review has shown that a severe allergy to tree pollens fluctuate from 1% to 65.9% (table 1). These findings emphasize the importance of pollens in causing allergic reactions in the inhabitants of the relevant regions of the country. Although mild symptoms of allergic reactions do not lead to hospitalization or absence from work, they may influence the sufferer's quality of life and bother individuals to such an extent that drug intervention may be needed. Hence, the main step in the management of allergy sufferers is to avoid sources of allergic pollens. This requires a vast survey to identify the type of pollen grains aeroallergens and severity of the allergic reaction.

A major concern about the published contributions in Iran is that the investigators have not indicated the ingredients of pollens used in the mixes extracts of tree allergens that they used for the skin prick tests. This information is important because pollen grains and extracts that are used in prick tests are supplied commercially and imported from other countries, hence they may not completely cover local pollens. In such cases, the skin prick test may not be a reliable tool for identifying allergies in patients.

Conclusion

Although it was attempted to map a complete picture of allergenic pollens in the Middle East, this review showed that the available data are still fragmentary. Hence, it is still difficult to draw a clear and perfect map of allergenic pollen grains of the trees across the region. Owing to the span of countries and the various species of flowers grown on trees in each region, it seems that allergists who are trained in identifying and managing allergic sensitivities should be aware, not only of the history of the patients but also be aware of the common allergenic pollens in each area and their seasonal air dispersion. The potential of climate changes in the distribution of allergenic tree species should be noticed by allergists. Furthermore, distribution and frequency of various allergens of pollen grains of newly imported trees need to be given more consideration and included in future studies.

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