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Environmental triggers in allergic diseases: An overview

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Abstract:

Allergy and asthma are increasing all over the world including India. The most effective method of management of allergic diseases is prevention and avoidance where ever possible natural history of allergy is influenced by many triggering Biological and non biological agents. Identification of these triggers such as pollen, moulds, mites and insect debris etc., are major factors for secondary prevention of environmental allergens. It is suggested in this brief review that educational programs should focus on avoidance of these triggers for effective management in addition to other forms of therapy.

Keywords:

Allergy triggers, house dust mite, indoor allergen, outdoor allergen

Introduction

Epidemiological and experimental studies have contributed to major advances in the field of allergy diagnosis; prevention of allergic diseases. A variety of risk factors play a multifaceted role, in the secondary prevention of allergy. Identification of allergy triggers forms the actual basis of secondary environmental prevention. These triggers include both indoor allergens such as house dust mites (HDMs), molds, pets, and cockroaches and outdoor allergens such as pollen grains, molds, and plant debris. Molds and their metabolites are considered to be triggers of respiratory allergy. Pets, dogs, and cats are well-known to trigger allergic symptoms in sensitized participants. Outdoor molds may trigger allergy and asthma exacerbations. Among outdoor allergens, pollens are important triggers of seasonal allergy symptoms such as allergic rhinitis, atopic dermatitis, and asthma.^[1]

Indoor Allergens

House dust mites allergens

HDM allergens are ubiquitous pyroglyphidae that are commonly found in human dwellings. These mites grow best with higher indoor humidity and elevated temperatures. Involvement of mites as triggers of allergy and asthma includes an association between HDM allergen exposure and patients.^[2,3] There have been several studies on avoidance procedures with respect to mite allergens.^[4,5] Four meta-analyses on HDM allergen avoidance by Platts Mills concluded that avoidance was of no benefit to asthmatic/allergic patients.^[4] Further, Custovic and Wijk concluded inadequate evidence to advocate avoidance in adults but have some benefit in children.^[5] However, Platt-Mills criticized the method of meta-analysis as allergen avoidance protocols are multipronged and personalized.^[4] Dusts collected from the houses of patients include many more contaminants besides mites as molds, bacteria, endotoxins, fungal glucans, mycotoxins, pollen, and insect-derived materials, etc.

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Thus, house dust avoidance procedures aimed directly on HDMs may only provide partial benefit to sensitized patients.^[6]

Molds (Fungi) avoidance

Among indoor triggers, fungi or molds are important microorganisms in patients' dwellings. Although there are thousands of fungal species, avoidance to 60–80 molds are considered allergenically important. There is direct association between dampness and mold proliferation leading to health impacts. The association between dampness and molds in houses has been reviewed by Cox Gamser.^[7] In the UK randomized controlled study, allergy symptoms and medications use declined in an interventional group as compared to control group.

Avoidance to pets

It is estimated that ~50% of families in developed countries have pets,^[8-10] so is the case of families with allergies. Cats are important triggers of allergic symptoms.^[11,12] Allergy to pets can be readily documented based on the clinical history. Allergic particles from pets are small ranging from 2 to 10 μ size which allows them to be airborne and even stick to cloths of sensitized subjects and floors. Although removal of cats from patients have may minimize their exposure, but may encounter from other locations as it is ubiquitous.^[13,14] When the cat remains in the house, basic avoidance measures do not help in decrease of pet allergen levels.^[15,16]

Dog allergens are found in the dog hairs, skin cells, saliva, and urine. Dog allergy is less common as compared to cats, and avoidance measures do not help much.

Insect Allergens

Cockroach allergens

Cockroach allergens are mostly found in kitchen with low- and middle-class houses. Allergy and asthma are associated with cockroach allergen exposure.^[15] It is observed that strategies that reduce cockroach allergen by environmental management are clinically beneficial to patients.^[17,18] A joint task force on environmental management of cockroaches has recently been summarized by major professional organizations.^[19] The environmental measures include clean kitchens, timely washing of utensils, keeping food items in closed containers, frequent disposal of garbage, setting of cockroach traps, and chemicals and sprays, etc.^[19]

Outdoor Allergens

Pollen allergens

Environmental management of pollen is relevant during their pollen season, particularly that are airborne and are important as allergens. During the

pollen period, patients are advised to (if possible) to be outdoor during early morning before sunrise and during the late afternoon.^[20,21] In addition to this, door and home windows should be kept shut to reduce pollen exposure from air. Patients are further advised to use air-conditioner, use pollen mask, and use showers after coming from outdoors.^[22,23] Patients also advised to cover their hairs for a long period during outdoors. Although there are common suggestions to minimize pollen exposure, these have not been validated scientifically.

Outdoor molds

Some of the fungi considered allergenically important as outdoor allergens are *Alternaria*, *Cladosporium*, and *Fusarium*. However, some of the aerophilic species such as *Penicillium* and *Aspergillus* are indoor allergens causing allergic diseases. Compared to indoor allergens, the diagnosis of outdoor mold allergy is difficult due to nonavailability of standardized mold allergen extracts. These fungi also have greater cross-reactivity with even taxonomically unrelated species.

Smoking

Passive smoking

It is well-established that passive smoking is associated with aggravation of asthma and allergy with increased hospitalization.^[19] The implementation of public ban on smoking has been observed to have reduced exacerbation of asthma. A meta-analysis of 11 studies published between 2008 and 2013 reported 10% of reduction in hospital admission after smoke ban.^[20]

Air pollution

Avoidance of outdoor air pollution is very hard to achieve because there is no realistic way for avoidance their exposure. In children with moderate asthma/allergy have decreased the lung function. Many regulatory agencies recommend that allergic patients may remain indoors during high pollution to avoid exposure to clinical and organic volatile substances. However, some believe indoor air pollution is also equally harmful to susceptible individuals.

When air quality index reaches certain harmful level, all patients should avoid outdoor exposure and reduce the time in outdoor air. Many organizations recommend wearing dust mask and taking antioxidants which may not be very effective.^[23,24] Therefore, sustained clean air remains the most effective way to reduce health effects of respiratory allergy patients that are pollutant related.

Weather parameters

In general, the effect of cold temperature triggers asthma symptoms and hospital visit, so is the ease of increasing temperature and increase in emergency

visits, particularly by elderly patients.^[25] High altitude has been well known to be associated with reduced mite exposure leading to reduced sensitization rate to mites.^[26] However, recent studies suggest that reduced allergy in high altitude could be due to overall reduction of pollen and molds leading to reduced exposure of outdoor allergens.

Stress and emotional constraints

Stress enhances the airway inflammation by modulating immune cell function. Psychological triggers have been consistently associated with exacerbation and emergency visits.^[26] Anxiety may exacerbate the effects of disrupted sleep on childhood asthma.^[27]

Recommendation from professional organizations

Recommendation by National Societies in the identification and managements of triggers vary widely. The US guidelines for management of allergy and asthma suggest trigger identification and avoidance instructions. The British Thoracic Society also recommends the identification of triggers and emphasize on the role of passive smoking. The French Society of Pulmonology provides a list of triggers. The American Academy of Allergy also recommends avoiding triggers.

However, with respect to allergen avoidance, there are discrepancies in their recommendations. The British Society does not recommend the use of physical and clinical methods for reducing HDM allergen levels in the home and concludes that single interventions have very limited or no effect. However, the British Society of Allergy and Clinical Immunology advocates that avoidance of HDM may be beneficial in highly motivated allergy patients with multiple interventions.^[28] The Allergic Rhinitis and its Impact on Asthma guidelines^[29] suggested not using single clinical or physical preventing method of avoidance but to use combinations.

Summary

To summarize, the natural history of allergy and asthma are influenced by many triggers of allergenic and nonallergenic origin. Educational programs should focus on patient's questions to address triggers. In many situations, the avoidance of triggers does not provide guarantee for success and multifaceted approach. It must be adopted in avoidance strategies.

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Conflicts of interest

There are no conflicts of interest.

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