

ROLE OF ENVIRONMENTAL ALLERGENS ON ATOPIC DERMATITIS

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Background: Atopic dermatitis (AD) is a chronic eczematous skin disease that develops in a patient with atopic diathesis, which is characterized by an increased liability to produce IgE antibodies for allergens mostly derived from environmental or inhalant allergens and food allergens. They are produced by cell-mediated allergic contact reactions, and recently contact sensitivity to various environmental allergens has been demonstrated in patients with AD. Atopic patients are recognized by their ability to produce large amounts of specific IgE antibodies to common substances as environmental allergens, i.e. house dust mites, grass pollens, animal danders, molds, food, etc. These antibodies can be detected by skin prick test. The aim of this study was to identify the sensitization against environmental or inhalants allergens through skin prick tests in the patients with atopic dermatitis. **Material and Methods:** This is a retrospective, descriptive study. We revised all medical records of patients with AD since January 2002 to December 2004 in the Out Patients Unit of Sanglah General Hospital, Bali-Indonesia. The variables studied were: gender, age, work related, diagnosis associates to AD, and prick test of environmental allergens. **Results:** In 3 years periods we had revised 46 of patients with AD that was done skin prick tests. The median age was 38 years (range 29-54 years), 34/46 (73.9 %) of these were male and 12 (26.1 %) female. Twenty nine patients presented pure AD, and 17 patients had AD with asthma and allergic rhinitis. Only 16 (34.7%) of patients had no history of allergic disease. Thirty six of 46 (78.20%) of all tested AD patients had a positive skin prick tests against inhalant (aeroallergens) 16 patients and food allergens 21 patients. Sixteen patients with positive of skin test include; dust mite in 12 patients, animal dander in 10 patients, grass pollen in 9 patients and cockroach in 6 patients. **Conclusion:** We concluded that Environmental work related particularly dust-mite were significant that contributed to symptoms exacerbation and positive skin prick test. The skin prick tests are important methods to determine inhalant allergens in work related that exacerbation of AD patients.

Keywords: Atopic dermatitis, Environmental, allergens, skin prick test.

INTRODUCTION

Atopic dermatitis (AD) is a chronic eczematous skin disease that develops in a patient with atopic diathesis, which is characterized by an increased liability to produce IgE antibodies for allergens mostly derived from environmental or inhalant allergens and food allergens.^{1,2} Experimentally, eczematous skin lesions cannot be induced only by immediate IgE-mediated reactions alone, but also by the other factors such as psychological stress. As general agreement that allergic reaction type I with pointed by increasing of IgE serum level is important role in the immune pathogenesis of AD. In atopic patients are recognized by their ability to produce large amounts of specific IgE antibodies to common substances as environmental allergens, i.e. house dust mites, grass

pollens, animal dander's, molds, food, etc. These antibodies can be detected by skin prick test.^{2,3}

Atopic dermatitis as the hypersensitivity reactions caused by allergen-specific IgE binding to mast cells, being cross-linked by subsequent allergen exposure, and releasing mediators of immediate hypersensitivity that initiate inflammatory cascades. More than 20 % of the general population suffers from AD, and commonly more than 30 % of less than 1 year-old children suffering this disease.^{2,4} Many researchers stated that AD have close relationship with environment allergens, but in our department have no accurate data. To know the role of environmental allergens as trigger factors in AD, skin prick test is important methods to determined allergen.

A major component of managing and possibly preventing these diseases is control of environmental allergens; indoor, outdoor allergen and air pollution. Indoor allergen commonly house dust mite (HDM), animal dander, cockroach,

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outdoor allergen including grass pollen, and air pollution is one of many factors that can as trigger factors to exacerbate and delineate of AD. Environmental control is essential for persons who are sensitive to dust mite and animal dander and may be important in persons who are sensitive to cockroaches. The bedroom is the most important room in which to implement environmental control. Carpet in the bedroom or workplace should be considered. For persons who are sensitive to pet allergens, permanent removal of the pet is recommended.

The aim of this study was to identify the sensitization against environmental or inhalants allergens through skin prick tests in the patients with atopic dermatitis.

PATIENTS AND METHODS

This is a retrospective, descriptive study. We revised all medical records of patients with AD since January 2002 to December 2004 in the Out Patients Unit of Sanglah General Hospital, Bali-Indonesia. The variables studied were: gender, age, work related, diagnosis associates to AD, and results of skin prick test of environmental and food allergens.

Skin prick tests were performed according to standard methods using normal saline as negative control and histamine (10 mg/mol) as positive controls. If a reaction occurred within 15 minutes, the transverse and vertical diameters of the wheal were measured. Wheals of 2 mm or greater were regarded as positive result, and if subjects with one or more positive reactions were considered atopic diathesis. All allergens extract made by Allergy Clinic Jakarta as standard skin prick test in Indonesia.

RESULTS

From January 2002 to December 2004, a total of 46 consecutive skin prick tests (SPT) were performed on adult atopic dermatitis (aged >15 years) at the out patients unit of the Sanglah General Hospital, Bali-Indonesia. The clinical diagnosis of atopic dermatitis was made according to the criteria of Hanifin and Rajka. The severity of diseases was assessed by use of SCORAD.

In 3 years periods we had revised 46 of patients with AD that was done skin prick tests. The median age was 38 years (range 29-54 years), 34/46 (73.9 %) of these were male and 12 (26.1 %) female. Twenty-nine patients presented pure AD, and 17 patients had AD with asthma and allergic rhinitis. Thirsty of 46 (65.2 %) said that they have a history of allergic disease, particularly food allergen. Only 16(34.7 %) of patients had no history of allergic disease. Thirsty three of 46 (71.4 %) of all tested in AD patients find more than one item of positive skin prick tests against allergens, and 13

were negative skin test of all item of allergens (see table 1).

Table 1
Skin Prick test reactivity to common environmental and food allergens in atopic dermatitis

Parameter	Prevalence (N=46)
Sex	
Male	34 (73.9%)
Women	12 (26.1%)
Age (year)	38.4 (29-54)
Atopic history	
Yes	30 (65.2%)
No	16 (34.8%)
Environmental allergens	
House dust mite	18 (39.1%)
Cockroach	14 (30.4%)
Cat dander	9 (19.7%)
Chicken dander	5 (10.9%)
Dog dander	11 (23.9%)
Grass pollen	9 (19.7%)
Mold/Fungal	7 (15.2 %)
Food Allergens	
Sea food	15 (32.6%)
Egg	13 (28.2%)
Soy	9 (19.7%)
Peanut	4 (8.7%)
Cocholate	3 (6.5%)
Meat	12 (26.0%)
Chicken meat	8 (17.4%)
Peneapple	3 (6.5%)
Atopy (≥ 1 positive skin test)	33 (71.4%)

DISCUSSION

In atopic dermatitis patients, the skin becomes extremely itchy and inflamed, causing redness, swelling, cracking, weeping, crusting, and scaling. Atopic dermatitis most often affects infants and young children, but it can continue into adulthood or first show up later in life. Environmental allergens may sometimes be related to atopic dermatitis. Many persons with atopic dermatitis are allergic to grass pollen, dust mite and cat dander and others. Usually this manifests as an immediate reaction with itching skin, some time followed by others allergic sign; runny nose, sneezing and swollen eyes, and improves after removal from the allergy source.^{4,5}

Atopy is the hypersensitivity reactions caused by allergen-specific IgE binding to mast cells, being cross-linked by subsequent allergen exposure, and releasing mediators of immediate hypersensitivity particularly histamine that initiate inflammatory cascades. There is a clear association between molecular component of house dust mite, grass pollen, animal dander and AD. The proposed

mechanism for the association between the allergens and hypersensitivity mechanism relates to the ability of allergens to augment allergen-specific IgE production, as well as alter the normal Th1/Th2 ratio toward a predominant Th2 profile and their Th2 cytokine such as; IL-4, IL-5 and IL-10. This cytokines play important role in immunopathogenesis of AD.^{1,6}

In the table shows the results of the skin test responses to a panel of common environmental allergens and food allergens.

Dust Mites

House dust mite is the most commons allergen (39.1%) as triggers factors in our study. The patients usually work as cleaning services in official government or private offices. Dust mites (*Dermatophagoides pteronyssinus*) are members of the family Acaridae that are about 0.3 mm long, feed on human skin scales, and are found in places with dust and high levels of humidity. Sensitivity to dust mite antigen is a strong predictor of asthma and asthma severity in atopic patients. Household with the highest levels of dust mite infestation include the following; carpets, pillows, mattresses, drapes, stuffed animals, clothing, and upholstered furniture, wall.^{5,6}

Cockroach

In the table 1 reveals 30,4 % of patients have positive result against cockroach. Sensitization and high exposure to cockroach allergen has been strongly associated with the patients with atopic state, and as risk of asthma. Cockroach allergens are found in household dust, with the highest concentrations located in the kitchen. The particles that carry cockroach allergen are relatively large (at least 10 µm in size) and remain airborne for a short period of time after a disturbance.

Animal dander (Pets)

Animal allergens, principally those from cats, dogs, rats, mice, horses, and cows, are also a common cause of acute and chronic allergic asthma. Allergic sensitization can occur in the home environment, as well as in the workplace. All warm-blooded animals produce potential allergens in their dander, urine, feces, and saliva. Persons who are sensitive to animal dander are at a higher risk of developing allergic disease and of having and exacerbation of AD when exposed to these allergens.^{5,6}

Grass pollen

Grass pollen allergy is a major human health problem throughout the world, perennial ryegrass (*Lolium perenne*) being one of the more important species causing exacerbate allergic diseases. Several proteins from this grass pollen have been characterized and used to study specific serum

antibody responses in individuals allergic to pollen proteins.^{5,6}

Mold/Fungal Allergens

Many studies conducted indicate that fungal sensitivity is common among allergic subjects. An accumulating body of evidence suggests that fungal sensitization, particularly to *Alternaria* species, is a risk factor for the development of asthma or AD, increased severity of asthma, AD. Fungal allergen exposures are generally considered to take place in outdoor environments; however, many species can invade homes through open cracks or windows.^{4,6}

All kind of allergen enters the body through skin surface as contactant and through nasal mucosa as inhalant allergen. In atopic patients is very sensitive against that allergen. Most patients with AD tend to be sensitive to more than one allergen.

Atopic dermatitis is a genetically complex disease that has a high familial occurrence. Twin studies of AD have shown concordance rates of 0.72–0.86 in monozygotic, and 0.21–0.23 in dizygotic, twin pairs. That means genetic factors play an important role in the development of this disease. In AD as part of a systemic atopic disorder, candidate genes involving IgE and Th2 cytokines have been identified. There has been particular focus on chromosome 5q31-33, as it contains a clustered family of Th2 cytokine genes. In our studies shown 65.2 % have family history atopic diathesis.

A comprehensive treatment plan typically involves a combination of allergen avoidance or controlled exposure coupled with appropriate pharmacotherapy.

Allergen Avoidance

The most fundamental of therapeutic principles is to avoid exposure to allergens that provoke immediate hypersensitivity reactions. The same holds true for indoor pets to which a patient is sensitive. Many allergens cannot be avoided completely, such as allergens contained in dust and mold, as well as grass and weed pollens. In these cases, minimizing exposure can have a positive therapeutic benefit. The most important factor in an environmental control program is avoidance of dust mite allergen. Exposure to dust mites can be reduced, but not eliminated, by regularly vacuuming the house, keeping soft toys and clothes shut away in cupboards, limiting floor carpets, washing linen in hot water and using protective mattress and pillow covers.^{3,8,9}

Drug Therapy

The classes of drugs available are used to either counteract the effects of most cell mediators on target cell receptors or decrease the release of mediators from mast cells. Emollient to protect skin surface is important to avoid contact with skin and to maintenance the humidity of skin. Systemic

antihistamine is needed to anti-allergic and anti pruritus. In order to reduce eadness and wheal of skin as inflammatory response, topical corticosteroid is considered. In severe and recalcitrants cases some topical and systemic immune-modulators is a new approaches in management of AD.^{1,3,9} However, environmental approaches is the most fundamental managements of AD.

REFERENCES

1. Werfel T. et al. Atopic Dermatitis – Trigger Factor and Pathofisiology. *ACI International* 2001;13: 85-90
2. Position statement. Environmental allergen avoidance in allergic asthma. Ad Hoc Working Group on Environmental Allergens and Asthma. *J Allergy Clin Immunol* 1999;103(2 pt 1):203-5.
3. Wood RA. The importance of environmental controls in the management of pediatric asthma. *Immunol Allergy Clin North Am* 1998;18:183-97.
4. Tovey E, Marks G. Methods and effectiveness of environmental control. *J Allergy Clin Immunol* 1999;103 (2 pt 1):179-91.
5. Ehnert B, Lau-Schadendorf S, Weber A, Buettner P, Schou C, Wahn U. Reducing domestic exposure to dust mite allergen reduces bronchial hyperreactivity in sensitive children with asthma. *J Allergy Clin Immunol* 1992;90:135-8.
6. Marshall GD. 2004. Internal and External Environmental Influences Allergic Disease. *JAOA*; 104/5: 1-6.
7. Nishioka K, Yasueda H, Saito H. Preventive effect of bedding encasement with microfibre fibers on mite sensitization. *J Allergy Clin Immunol* 1998;101(1 pt 1):28-32.
8. Murray AB, Ferguson AC. Dust-free bedrooms in the treatment of asthmatic children with house dust or house dust mite allergy: a controlled trial. *Pediatrics* 1983;71: 418-22.
9. Bierman CW. Environmental control of asthma. *Immunol Allergy Clin North Am* 1996;16:753-64.
10. Arshad SH, Matthews S, Gant C, Hide DW. Effect of allergen avoidance on development of allergic disorders in infancy. *Lancet* 1992;339:1493-7.



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