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Prevalance of skin reactivity to fungal antigens in patients of nasobronchial allergy of Jalandhar and neighbouring area in Punjab

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Abstract

Atmospheric allergens play an important role in the pathogenesis of naso-bronchial allergy. It is important to know the prevalence of allergens in one «SQ»s area for proper diagnosis and effective management. The data of positive reaction to fungi on 1500 patients of nasobronchial allergy has been included in this study. Allergy test (skin testing with intradermal injection of antigen) was conducted on patients and the results were interpreted by comparing the wheal produced by the test substance in relation to the control. While analyzing the results 60 patients were excluded because of ($\pm$) or one plus (+) cutaneous reaction to fungal antigens. Topping the list, *cladosporium* was positive in 158 patients (11%) followed by *Alternaria tenuis* in 144 (10%), *Curvularia lunata* in 108 (7.5%), *Helminthosporium sp.* in 115 (8%). Moderate positives were *Rhizopus nigricans* in 92 (6.4%) patients, *Candida albicans* in 86 (6%), *Aspergillus fumigatus* in 86 (6%), *Mucor mucedo* in 83 (5.8%), *Aspergillus niger* in 81 (5.6%), *Phoma batæ* 79 patients (5.5%), *Aspergillus tamarii* 72 (5.5%), *Trichoderma* 72 (5%). The low positives were *Penicillium* in 50 patients (3.5%), *Aspergillus flavus* 43 (3%), *Nigerospora* 41 (2.5%), *Neurospora sitophila* 41 (2.5%), *Epicoccum purpurascens* 31 (2.2%), *Aspergillus versicolor* 30 (2%) and *Fusarium solani* 28 (2%) patients. Information about fungal antigen positivity is being provided in the present article, which would serve as a reference to the physicians dealing with allergy patients as well as those studying environmental sciences.

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Full Text

Introduction

Atmospheric allergens play a significant role in the pathogenesis of naso-bronchial allergy particularly rhinitis and asthma. Pollens, fungi, animal dander, house dust mite, and domestic pets are some of the important triggering factors for naso-bronchial allergy. Amongst the aeroallergens pollens have been studied maximally, followed by the fungi. The latter play an important role in disease causation.

Naso-bronchial allergy is prevalent amongst all the populations of the world. [1],[2],[3],[4] Epidemiological data suggests the prevalence of respiratory diseases from 15% to 30%. [5] In India 20% of the population has rhinitis and 15% develop bronchial asthma, according to a recent survey. [6] It is quite evident that the incidence has increased over the years, if we compare this with the earlier data. [7]

For a proper diagnosis and effective management it is important that one should be familiar with the prevalence of allergens in one's area. The purpose of the present study was to find out fungi detected by intradermal tests in Jalandhar and neighboring areas of Punjab state.

Materials and Methods

Our study includes the data of positive reaction to fungi in 1500 patients aged 14-57 years of nasobronchial allergy. The data has been collected over a period of 29 years from 1982 to 2011. Out of 1500 patients (56% males and 44% females) 967 were suffering from nasal allergy, 500 from bronchial allergy and 33 patients from ocular allergy. The duration of illness varied from 1 year to 30 years. The allergy tests were conducted on patients who were not on antihistamines and steroids for 72 and 48 h respectively. Children lesser than 14 years, were not included because a good percentage of them may get automatic remission beyond this age.

Skin testing

Intradermal injection of antigen (1:500 dilutions) was administered on the arm or volar surface of the forearm. Each patient was tested with 0.01 ml of 1:500 concentration (w/v) extract of fungal antigen. A negative control with buffered saline and a positive control with 100 mcg/ml of histamine acid phosphate were used in the study. The skin reactions were read after 15-30 min and were graded according to the criteria already published. [8] The results were interpreted by wheal produced in relation to the negative control. Because of high incidence of one plus reaction in non-allergic individuals this group was excluded from the study, and only high positive were considered and analyzed.

Results

Out of 1500 patients 1440 were taken for analysis. Sixty patients were excluded because of one plus or $\pm$ results.

[Table 1] depicts the results of cutaneous reactivity to various fungi (arranged in decreasing order of their allergenicity). Most of the fungi yielded 2 plus to 3 plus results. *Cladosporium herbarum* was positive in 158 (11%), *Alternaria tenius* in 144 (10%), *Curvularia lunata* in 108 (7.5%), *Helminthosporium* sp. 115 (8%), *Rhizopus nigricans* in 92 (6.4%), *Candida albicans* 86 (6%), *Aspergillus fumigatus* in 86 (6%), *Mucor mucedo* in 83 patients (5.8), and *Aspergillus niger* 81 patients (5.6%). [Table 1]

Fungi showing less positive reaction were *Penicillium* sp., *Neurospora sitophila*, *Nigrospora* sp., *Epicoccum purpurascens*, *Aspergillus versicolor*, *Fusarium solani* and *Aspergillus flavus*.

Discussion

There are a few studies on aerospora of Punjab. The "All India Co-ordinated project on Aerobiology" carried out in Amritsar [9] (1980-81) found *C. herbarum*, *A. tenius*, *C. lunata*, *Helminthosporium* sp., *Nigrospora* sp., *Tetraploa*, *Aspergilli penicilli*, *F. solani* and *E. purpurascens* as some of the major aero-spora. *M. mucedo* and *Trichoderma* were the minor ones. *Phoma batatae* and *R. nigricans* were not detected. Our study is very much in consonance with the data obtained from "All India Project on Aerobiology."

Another aerial survey of fungal spores in Amritsar (Punjab state) by Sandhu and Randhawa demonstrated *Aspergillus* species to be the commonest fungus followed by *Alternaria tenuis*, *C. lunata* and *F. solani*. [10]

Another study on aerospora from Delhi by Rashmi Sharma et al. [11] on indoor and outdoor environments showed that species of *Aspergillus*, *Cladosporium*, *Alternaria* and *Penicillium* were the most commonly encountered fungi. The highest concentrations were recorded in January, April, and February in that order, while the lowest concentrations were observed in June when temperature in Delhi is high. The four major fungal spores found positive (I/D testing) in our study are *C. herbarum* (11%), *A. tenuis* (10%), *Helminthosporium* (8%), *C. lunata* (7.5%). The moderate positives are *R. nigricans* (6.4%), *C. albicans* (6%), *A. fumigatus* (5.9%), *M. mucedo* (5.8%), *Asp niger* (5.6%), *P. batae* 5.5%, *Asp tamari* 5%, *Trichoderma* 5%.

Another study (using cutaneous testing) from North India [12] had found positivity in the following order: *C. lunata* (9.2%), *A. tenuis* (7.2%) *P. batae* (5.7%), *A. fumigatus* 5.6%, *Nigrospora sitophola* 5.1%. Positivity of 2 to <5% was seen in the following order: *M. mucedo* 4.8%, *Asp Niger* 3.6%, *Helminthosporium* 3.6%, *Trichoderma* 2.4%. All these allergens played a significant role in causing naso-bronchial allergy. The study also observed that 3+ to 4+ reaction seen with one fungal antigen resulted in 2+ to 4+ reaction to 3-6 more fungal allergens. This shows an antigenic determinant being common to some fungi. This phenomenon was rarely observed in case of pollen antigens.

Rajendra Prasad et al. [6] in 2009 found high positivity to *C. herbarum* (10.2), *A. tenuis* 8.3, *C. lunata* 7.4% and *Helminthosporium* 11.1%. Their results varied from this study in positivity for *A. fumigatus*, *A. flavus*, *M. mucedo*, *C. albicans*, and *F. solani* [Table 2].{Table 2}

A study by Acharya [13] had similar positivity for *C. herbarum*, *A. tenuis*, *C. lunata*, and *Helminthosporium* [Table 2].

It may not be out of place to quote here that even in 1968 Agarwal et al. [14] on aerospora study found spores of *A. tenuis*, *C. herbarum*, *C. lunata* and *Helminthosporium* as the most frequent in that order.

Alternaria, *Aspergillus*, *Cladosporium* and *F. Solani* have been reported as important fungal allergens in India; [6],[14],[15] while recently Rashmi Sharma et al. [11] on skin prick tests found marked skin reactivity to *Alternaria alternata* (17.9%), followed by *A. Fumigatus* and *Penicillium citrinum* (15.5%) from Delhi region in children; while *A. niger* showed least marked skin reactivity. An almost similar positivity to fungal antigen was seen by Mangla Satputu [15] on aero spora from Shillong region. 3+ reactivity was observed in *C. herbarum*, *A. tenuis*, *C. lunata*, *Helminthosporium*, *A. fumigatus*, *Asp tamari* and 2+ and 1+ in *M. mucedo* and *Trichoderma*.

In Amritsar study by Singh et al. [9] *Cladosporium herbarium* is the most common in all areas of India followed by *Alternaria* (13 localities), *C. lunata* (12), *Helminthosporium*, and *Nigrospora* (10 localities).

The fungal spores like *Phoma*, *M. mucedo*, and *R. nigricans* have been observed in very few localities. All these studies show that the fungal spores do not vary much from region to region unlike the pollen grains. [16],[17]

Conclusion

Thorough information about aerospora is already available and now information about fungal antigen positivity is being provided in the present article, which would serve as a reference to the physicians dealing with allergy patients as well as those studying environmental sciences.

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Table 1: Percentage positivity to various fungi in the descending order of positivity and number of patients (in brackets)

Fungi detected	Present study (percentage and number of patients)
<i>Cladosporium herbarum</i>	11 (158)
<i>Alternaria tenuis</i>	10 (144)
<i>Helminthosporium sp.</i>	8 (115)
<i>Curvularia lunata</i>	7.5 (108)
<i>Rhizopus nigricans</i>	6.4 (92)
<i>Candida albicans</i>	6 (86)
<i>Aspergillus fumigates</i>	5.9 (86)
<i>Mucor mucedo</i>	5.8 (83)
<i>Aspergillus niger</i>	5.6 (81)
<i>Phoma batae</i>	5.5 (79)
<i>Aspergillus tamari</i>	5 (72)
<i>Trichoderma sp.</i>	5 (72)
<i>Penicillium sp.</i>	3.5 (50)
<i>Aspergillus flavus</i>	3 (43)
<i>Nigrospora sp.</i>	2.85 (41)
<i>Neurospora sitophila</i>	2.85 (41)
<i>Epicoccum purpurascens</i>	2.2 (31)
<i>Aspergillus versicolor</i>	2.1 (30)
<i>Fusarium solani</i>	2 (30)

Table 2: Comparing the positivity of various fungi in different studies including the present one

Fungi detected	Present study (clinical)	Acharya 1980% 2-4 plus (clinical)	Satputi et al. 1983	Shivpuri 1980 (clinical)	Prasad et al. 2009 (clinical)	Singh et al. 1980-81
<i>Cladosporium</i>	11 (158)	5.9	+++	1.8	10.2	14
<i>Alternaria tenuis</i>	10 (144)	6.4	+++	7.2	8.3	13
<i>Curvularia lunata</i>	7.5 (108)	6.7	+++	9.2	7.4	12
<i>Helminthosporium sp.</i>	8 (115)	12.5	+++	3.6	11.1	10
<i>Nigrospora</i>	2.85 (41)	6.0	+++	5.6	13.6	
<i>Aspergillus fumigates</i>	5.9 (86)	6			10.7	
<i>Aspergillus tamari</i>	5 (72)	5.4		3.5		
<i>Neurospora sitophila</i>	2.85 (41)	11.7		5.1		
<i>Aspergillus flavus</i>	3 (43)	13.2			11.3	
<i>Phoma batae</i>	5.5 (79)	5.5		5.7		1
<i>Rhizopus nigricans</i>	6.4 (92)	6.2		3.3	6.6	-
<i>Mucor mucedo</i>	5.8 (83)	5.9	++	4.8	9.4	1
<i>Aspergillus niger</i>	5.6 (81)	8.6		3.6	2.8	
<i>Aspergillus versicolor</i>	2.1 (30)	3.5				
<i>Candida albicans</i>	6 (86)	10.6			11.1	
<i>Fusarium solani</i>	2 (30)				23.6	7
<i>Penicillium</i>	3.5 (50)				8.3	
<i>Trichoderma</i>	5 (72)	5.4	+	2.4	3.2	3
<i>Epicoccum purpurascens</i>	2.2 (31)					

+++ - Highly positive, ++ - Moderately positive, + - Average positive