



A Brief Survey of Fungi as Allergen in Respiratory Allergic Patients by Intradermal Skin Sensitivity Test in Terai Area

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ABSTRACT

The present survey was conducted to observe allergic effect of various fungi in patients of respiratory allergy of terai area. Terai area has humid, subtropical climate, warm in winter and hot in summer total of 96 patients were studied after full clinical examination. Age group of patients was 12 to 48 yrs and male female ratio was 3:2. About 12% patients had acute problem of breathlessness and rhinitis while rest were having chronic respiratory allergy. Intradermal test was performed to observe skin sensitivity. *Rhizopus nigricans* was found most offending fungal allergen (50%), Next to it was *Aspergillus fumigates* (30 %). Among other fungal allergens eg. *Alternaria tenuis* (28 %), *Aspergillus flavus* (26 %), *Curvularia sp.* (24 %), *Neurospora Sp.* (22 %), *Phoma sp.* (18 %), *Fusarium solani* (13 %), *Helminthosporium sp.* (12 %) and *Penicillium sp.* (11 %) were found as common fungal allergens. *Acrothecium sp.*, *Aspergillus niger*, *Aspergillus tamari*, *Candida albicans*, *Cladosporium sp.*, *Mucor sp.*, *Nigrospora sp.* and *Trichoderma sp.* etc were having allergenic effect in less than 10 % patients. About 12 % patients had not shown positive skin sensitivity test against any fungal allergen.

1. INTRODUCTION

The present study is the survey of fungal allergens in terai area. Terai is also known as madhesh in Nepali is the flat southern region of Nepal which stretches from east to west. In south of Terai there is eastern Uttar Pradesh and Bihar. The terai has a subtropical climate and it can often be humid. One of the most important physical parameters affecting fungal growth is moisture. Although it is widely stated that relative humidity over 70% is needed for active fungal growth, the water activity of the substrate is actually the critical parameter. Many species of fungi require high water activities, but the xerophilic (osmophilic) fungi are able to grow under lower water activity conditions than any other organisms [1, 2]. Day temp. ranges from 20 to 25 °C in winter 1964, nights are cool some time cold. Optimum growth temperature among species of fungi vary but commonly between 18 °C to 32 °C. Fungi grow over a wide temperature range (-5 to 50 °C and greater) [2, 3, 4], Fungi grow almost everywhere, even as lichens inside Antarctic rocks [5].

Monsoon goes from mid June to mid September. Most area of Terai get 1500 mm of rains in a year. Fungal allergy is a worldwide problem [6] Fungi have long known association with human diseases. Sensitivity to a variety of fungi is known to be a factor in allergic rhinitis and asthma. The amount of exposure that causes illness is related with individual sensitivity.

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Mould spores can be found in outdoor or indoor environments [7,8,9], but exposure can also occur by having contact with saprophytic species [10] or by ingestion of edible mushrooms [8,11] The fungi involved in Type -1 respiratory allergies are mostly saprophytes that grow on naturally occurring dead and decaying organic matter. Exposure to allergenic moulds may lead to rhinitis and asthma [12, 13], atopic dermatitis [10, 13, 14], .Inhalation of fungal spores carrying allergens has been claimed as a risk factor for severe asthma [15].

Epidemiological surveys support that asthma affects 5-30% of children and 2-30% of adults [16, 17] .This wide range of inter-survey fluctuation is mainly due to the different geographic distribution .Rhinitis affects 40% of the population. Among all patients suffering from respiratory allergy symptoms, 20-30% of them are sensitized to fungal spores [18]. Different species of fungal spores disperse in the atmosphere, which are characteristic of each region. Fungal spores involved in allergic diseases belong to 80 genera, the most significant of which belong primarily to Zygomycetes and Ascomycetes and Deuteromycetes and, secondly, to Basidiomycetes [18, 19, 20].

2. MATERIAL AND METHODS

This survey was conducted in patients who are suffering from bronchial asthma, allergic rhinitis related with other allergic symptoms like sneezing and cough of who attended the district hospital of Balrampur of Uttar Pradesh. It was important to know when & how the symptoms develop and what is the relationship with seasons, damp weather, physical activity and certain foods.

Pregnant and lactating females were not included in this survey. Clinical examinations, blood eosinophiles, sputum examination and X ray chest were performed to all patients before allergy testing to exclude other diagnosis. For present survey antigens were obtained from Allergen division Curewel (India) limited an Indo- vulgarian joint venture. 19 type of fungal extracts were selected for survey. Before performing intradermal test, oral drugs were stopped but inhaled drugs were continued. Oral antihistaminics were stopped 3 days before and oral sympathomimetic were stopped 12 hrs before performing the test. Patients on corticosteroids for more than two weeks were called for allergy testing at least after three weeks. About 0.01 ml of each extract in conc. Of 1:500 was injected intradermally. The common sites used for the skin test were the volar aspect of the for arms starting about 5cm proximal to the crease of the wrist and the lateral aspect of the upper arms. Phosphate Buffer saline was used as negative control and histamine as positive control. The skin is cleaned with 70% alcohol swab and allowed to dry. The individual test sites are 5 cm apart to avoid overlapping of reactions. The tests were read after 15 to 20 minutes graded according to criteria. Assessment of skin reactivity was done according to criteria proposed by Shivpuri including modifications. Positive reaction with association of history was incorporated in this study.

3. RESULTS

In this present brief survey the sum of patients were 96. Out of these 96 patients 58 (60.4 %) were male and 38(39.6 %) were female. Average age of patients was 27.5 yrs as shown in table 1.

Table. 1: Age Distribution of Patients.

Age distribution	No. Of Patients	% of Patients	Average age
10 – 20	18	18.75	17
20 – 30	51	53.12	26
30 – 40	16	16.66	34
40 – 50	11	11.45	43

Table – 2 SKIN SENSITIVITY TO VARIOUS FUNGAL ALLERGENS

Name of Fungi	Sensitivity %	Grade 1+ (%)	Grade 2+ (%)	Grade 3+ (%)	Grade 4+ (%)
Acrothecium Sp.	8	22	68	10	–
Alternaria Sp.	28	32	68	–	–
Aspergillus Flavus	26	16	54	30	–
Aspergillus Fumigates	30	18	55	17	10
Aspergillus Niger	8	14	86	–	–
Aspergillus Tamaritii	5	16	76	8	–
Aspergillus sp.	6	36	52	12	–
Candida Albicans	9	35	28	32	5
Cladosporium Sp	9	42	47	11	–
Curvularia Sp.	24	18	46	30	6
Fusarium Sp.	13	22	60	28	–
Helminthosporium Sp.	12	54	42	–	4
Mucor Sp.	8	34	62	4	–
Neurospora Sp.	22	42	58	–	–
Nigrospora Sp	8	30	26	42	2
Penicillium Sp.	11	24	60	14	2
Phoma Sp.	18	30	52	18	–
Rhizopus Nigricans	50	32	46	18	4
Trichoderma Sp.	6	24	56	16	4

Out of 96 symptomatic patients, in whom the allergy testing was performed, 12% patient had not shown any positive reaction. Rest 88 % patients who had shown positive reactions are shown in Table 2. Rhizopus nigricans had proved the most offending allergen (50 %), next to it was Aspergillus fumigates (30 %) and Alternaria (28 %). Terai population were sensitive with Aspergillus flavus (26 %), Curvularia sp. (24 %) and Neurospora sp. (22 %). Sensitivity was ranging in 11 to 18 % patients for Phoma sp., Fusarium sp., Helminthosporium sp. And Penicillium sp. Other fungi were having sensitivity in less than 10 % patients.

4. DISCUSSION

There are 80 genera of most important fungal groups have been connected with respiratory diseases. The most common fungal groups are as Zygomycetes, Ascomycetes, Basidiomycetes and Deutromycetes. Ascomycetes tend to release spores during periods of high humidity or high rainfall or microenvironment with high water content. Basidiomycetes comprise mushrooms, rusts and smuts, dominate the outdoor air flora. The Deutromycetes, species are allergenic such as Cladosporium, Fusarium and Alternaria, fairly common in excessive moisture in indoor air flora. Several species and genera have been reported to cause fungal allergy. Epidemiological, environmental, and medical research was focused on relevant species like Alternaria [21, 22], Aspergillus [23], Cladosporium [21, 24], and Penicillium [25]. These results are in support of present survey. The fungal species of Rhizopus spp. belongs to Zygomycetes and comprises the most common indoor allergenic fungal spore family, along with mucor species, altogether known as moulds [19, 26, 20].

IgE – mediated sensitivity to fungi is demonstrated by means of skin testing with extracts prepared from fungi, although sensitivity does not necessarily reflect disease but it helps to determine the frequency of severity of respiratory allergic symptoms. National and international studies indicate that fungal sensitivity is common among asthmatics. The outdoor environment of the source of the fungal spores includes cereal crops, decaying vegetable and organic waste on which fungi thrive while indoor environment, the sources are damp walls, dustbins, window pans, mattresses, leaking pipes and humidifiers. Max studies on fungi as aeroallergen have been limited to the fungi imperfecti (class Deutromycetes) with little information on allergenicity of members of other fungal groups.

From Delhi to Dehradun Alternaria is reported to be very high in conc. Followed by Cladosporium [27,29]. At Solan and Lucknow, Aspergillus, penicillium followed by Cladosporium and Helminthosporium are the dominant type [28]. Study carried out at Gorakhpur, Calcutta and Gauhati [30] revealed that Aspergillus, penicilli, Cladosporium, Nigrospora and the Rhizopus as the major of east India.

Beside the outdoor environment, indoor and work environment are also greatly influenced by fungi especially occupational sites employing organic raw materials grainary, poultry, flourmills, bakery and sugar factory etc [31].

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6. REFERENCES

- Burge, H. A., W. R. Solomon, and M. L. Muilenberg. . Evaluation of indoor plantings as allergen exposure sources. *J. Allergy Clin. Immunol.* 1982 70:101-108.
- Gravesen, S. Fungi as a cause of allergic disease. *Allergy* 1979 34:135-154.
- Kendrick, B. The fifth kingdom. Mycologue Publications, Waterloo, Canada. 1985s
- Salvaggio, J., and L. Aukrust.. Mold-induced asthma. *J. Allergy Clin. Immunol.* 1981 68:327-346.
- Friedman, E. I. Endolithic microorganisms in the antarctic cold desert. *Science* 1982 215:1045-1053
- Lehrer SB, Hughes JM, Altman LC et al. Prevalence of basidiomycete allergy in the USA and Europe and its relationship to allergic respiratory symptoms. *Allergy* 1994; 49:460-5.
- Katz Y, Verleger H, Barr J, Rachmiel M, Kiviti S, Kuttin ES. Indoor survey of moulds and prevalence of mould atopy in Israel. *Clin Exp Allergy* 1999; 29:186-92.
- Helbling A, Brander KA, Horner WE, Lehrer SB. Allergy to basidiomycetes. *Chem Immunol* 2002; 81:28-47.
- Bush RK, Portnoy JM. The role and abatement of fungal allergens in allergic diseases. *J Allergy Clin Immunol* 2001; 107:430-40.
- Scheynius A, Johansson C, Buentke E, Zargari A, Tengvall LM. Atopic eczema/dermatitis syndrome and Malassezia. *Int Arch Allergy Immunol* 2002; 127:161-9.
- Torrice R, Johansson SG, Wuthrich B. Ingestive and inhalative allergy to the mushroom *Boletus edulis*. *Allergy* 1997; 52:747-51.
- Kivity S, Schwarz Y, Fireman E. The association of perennial rhinitis with *Trichophyton* infection. *Clin Exp Allergy* 1992; 22:498-500.
- Scalabrin DM, Bavbek S, Perzanowski MS, Wilson BB, Platts- Mills TA, Wheatley LM. Use of specific IgE in assessing the relevance of fungal and dust mite allergens to atopic dermatitis: a comparison with asthmatic and nonasthmatic control subjects. *J Allergy Clin Immunol* 1999; 104:1273-9.
- Nissen D, Petersen LJ, Esch R et al. IgE-sensitization to cellular and culture filtrates of fungal extracts in patients with atopic dermatitis. *Ann Allergy Asthma Immunol* 1998; 81:247-55.
- Neukirch C, Henry C, Leynaert B, Liard R, Bousquet J, Neukirch F. Is sensitization to *Alternaria alternata* a risk factor for severe asthma? A population-based study. *J Allergy Clin Immunol* 1999; 103:709-11.
- Burney PG, Luczynska C, Chinn S, Jarvis D. The European Community Respiratory Health Survey. *Eur Respir* 1994; 7:954-960.
- The international Study of Asthma and Allergy in Childhood (ISAAC) Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhino conjunctivitis and atopic eczema. *Lancet* 1998; 351:1225-1232.
- Kurup V, Shen H, Banerjee B. Respiratory fungal allergy. *Microbes and Infection* 2000; 2 (9):1101-1110.
- Al-Doory Y, Domson J. Mould Allergy. Philadelphia, 1984.
- Alexopoulos CJ, Mims CW, Blackwell M. Introductory Mycology (4th Edn), John Wiley and Sons, New York, USA, 1996: 868.
- Achatz G, Oberkofler H, Lechenauer E et al. Molecular cloning of major and minor allergens of *Alternaria alternata* and *Cladosporium herbarum*. *Mol Immunol* 1995; 32:213-27.
- Halonen M, Stern DA, Wright AL, Taussig LM, Martinez FD. *Alternaria* as a major allergen for asthma in children raised in a desert environment. *Am J Respir Crit Care Med* 1997; 155:1356-61.
- Cramer R. Molecular cloning of *Aspergillus fumigatus* allergens and their role in allergic bronchopulmonary aspergillosis. *Chem Immunol* 2002; 81:73-93.
- Breitenbach M, Simon-Nobbe B. The allergens of *Cladosporium herbarum* and *Alternaria alternata*. *Chem Immunol* 2002; 81: 48-72.
- Lehrer SB, Lopez M, Butcher BT, Olson J, Reed M, Salvaggio JE. Basidiomycete mycelia and spore-allergen extracts: skin test reactivity in adults with symptoms of respiratory allergy. *J Allergy Clin Immunol* 1986; 78:478-85.
- Bush R. Aerobiology of pollen and fungal allergens. *J All Clin Immunol* 1989; 64:1120-1124.
- Agrawal, M.K. Studies on allergenic fungal flora o Delhi atmosphere Ph.D Thesis University of Delhi, Delhi 1970
- Agrawal, M.K. Shivpuri, D.N. Fungal spores-their role in respiratory allergy. *Adv.Pollen-spore Res.* 1974 1:78 - 128,
- Sandhu, D.K, Sivpuri, D.N.Sandhu, R.S.Studies on air borne fungal spores in Delhi Their role in respiratory allergy.*Ann.Allergy*, 1964 22:374,.
- Anonymous All India conducted project on Aeroallergens and Human Health -Report Ministry of Environment and forests, New Delhi. 1998
- Horejski,M, Sach,J, Tomsikova,A, Med.A.,A syndrome resembling farmers lung in workers inhaling spores o *Aspergilli* and *Penicilli* moulds. *Thorax*, 1060 15:212

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