

Aerobiological survey of Hooghly district with reference to offending agents of allergic disorders

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Abstract

An aerobiological survey of Hooghly district was conducted from February, 1999 to January 2000. The aim of this study was to identify various airborne allergens responsible for manifestations of allergy ailments. Fifty two types of pollen and fourteen types of airborne fungi were recorded from the atmosphere. Two main seasons were recognized, (1) Mid-January to April and (2) September to November. The first season was loaded with tree pollens while the second season was represented by pollen of weeds and grasses. Fungal spores were present throughout the year with seasonal exacerbations.

INTRODUCTION

The knowledge of aerobiological components is of immense importance due to their applications in different fields of human interest. The role of airborne pollen-spores in human allergy with reference to Hayfever was discovered very early by Blackley in England. Since then, an array of workers all over the world have made substantial contribution to establish the bearing of pollen-spores in allergic diseases in man.

Nasobronchial allergy (allergic rhinitis, allergic asthma) is quite common in India as in many other countries. For effective treatment of allergic disorders their causative allergens are required to be detected. Therefore, the study of 'airspora' (pollen, fungal spores etc.) in a particular area is pre-requisite in establishing offending allergens for diagnosis and

treatment of allergic disorders.

Aerobiological surveys were conducted in few cities of the eastern part of the country during the recent years. As a result, information on aeroallergens is available for Calcutta (Chanda *et al* 1974); Durgapur (Bhattacharya *et al*, 1981); Darjeeling (Kundu *et al*, 1981); Kalyani (Mondal *et al*. 1977) and Shilong (Singh, 1981). However, no such work has been done in Hooghly district regarding the types of inhalants prevalent in the air and their clinical relevance in the diagnosis and treatment of allergic disorders.

The present study was aimed to identify various airborne pollen and spores and their seasonal variations and clinical significance in allergy ailments.

MATERIALS AND METHODS

Trips were made to different localities of Hooghly district to list the allergenic plants with their frequency.

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palynological details and to record the flowering periods. Durham's Gravity slide method, has been used in this study to trap the airborne particles. Techniques employed for preparing, exposing slide, staining and counting of the airborne particles were the same as recommended by the National Pollen Survey Committee of American Academy of Allergy and Pollen, Mould and Insect Committee of Indian College of Allergy and Applied Immunology.

Microscopic slides (75mm × 25mm) coated with thin film of safranin-stained glycerin jelly were exposed for 24 hours in three different localities. The exposed slides were transported to M/s Creative Drug Industries, Mumbai for mounting and examination. The larger dust particles were removed with the help of a dissecting needle from the exposed slides. Then the exposed slides were warmed over a flame to remove moisture and a drop of melted safranin stained glycerin jelly was added and mounted with a cover glass No 1 (22mm × 22mm). The size of the cover glass was kept constant throughout the investigation. Glycerine jelly was prepared by employing the technique as described by Erdtman (1952).

The mounted slides were examined after a few days. All examinations were made under high power microscope (25 × 40) and this magnification was also used for identification of pollen-spore types. The identification of airborne allergens (pollen and fungal spores) was done mainly with the help of reference slides. It was also confirmed by the detection of plants species flowering during that period. In the case of airborne fungal spores, the identification was confirmed with the help of reference slides and standard illustrations.

Counting of the airborne particles was done for the whole area (22mm × 22mm) under cover glass. The results were expressed as per sq cm area. Those pollen and spores whose identity could not be established are written within brackets. However, the conclusions reached are based on the comparison of the airborne types with reference slides prepared from pollen of the common flowering plant species.

RESULTS AND DISCUSSIONS

Since various regions differ in the variety and extent of floral elements, it is obvious that airborne

pollen and spores pattern is essentially of regional type. The knowledge of the distribution pattern and flowering period of the commonly growing plant species is helpful in specific identification of airborne pollen types.

A systematic survey of Hooghly district revealed that there are about 10% plant species which are suspected to be allergenically significant and fully satisfy Thommen's postulate. Systematic field surveys conducted earlier to list allergenic plant species in other parts of the country (Tripathi, 1981) also revealed that a small number of plant species are significant in shedding large quantity of pollen into environment and are allergenically important.

During the course of study, a total number of 360 slides were exposed at three different selected sites for a period of 12 months. About 52 different types of airborne pollens belonging to different anemophilous and entomophilous species were observed to be present in the air over Hooghly district. The predominant pollen types were of anemophilous species belonging to *Cocos nucifera*, *Ailanthus excelsa*, *Holoptelea integrifolia*, *Putranjiva roxburghii*, *Borassus flabellifer* and members of family *Arecaceae*, *Amaranthaceae*, *Chenopodiaceae* and *Poaceae*.

Aerobiological surveys conducted in the eastern region of the country (Chanda and Nandi, 1971; Mandal et al 1977; Chanda and Mandal 1980; Bhattacharya et al, 1981, Kundu et al, 1981, Singh et al, 1981) have also revealed that pollen belonging to the anemophilous plant species are predominant in the atmosphere. The presence of fair amount of grass pollen in the atmosphere is perhaps due to their wide distribution and strictly anemophilous nature. Though, it was difficult to identify grass pollen due to their indistinguishable morphological characters, however, with the help of floristic survey of the area these palynomorphs were attributed to; *Zea mays*, *Sorghum vulgare*, *Pennisetum typhoides* among the cultivated varieties and *Cynodon*, *Cenchrus ciliaris*, *Ischemum*, etc, among the wild variety.

The other pollen which showed fairly good occurrence in the air belonged to the family *Chenopodiaceae* (*Chenopodium album*, *Chenopodium murale*), *Amaranthaceae* (*Amaranthus*

spinosus), *Myrtaceae*(*Eucalyptus* sp.) *Arecaceae* (*Rostonia* sp.) *Cyperaceae* (*Cyperus* sp.), *Ricinus communis*, *Parthenium hysterophorus*, *Peltophorum pterocarpum*, *Xanthium strumarium*, *Typha* sp. *Azadirachta indica*, *Trema*, *Bombax*, *Cassia siamea*, *Acacia* sp., *Prosopis juliflora*, *Plantago*, *Morus* sp., etc. Occasional and sporadic incidence was observed of pollen belonging to *Ageratum*, *Alternanthera* *Ipomoea* sp. and family-*Umbelliferae*.

From the aeropalynological data collected during different months, mainly two pollen seasons were recognized: (i) Mid-January to April and (ii) September to November. The first pollen season was loaded with tree pollen. The tree pollen types predominately belonged to *Ailanthus*, *Putranjiva*, *Holoptelea*, *Cocos*, *Borassus*, *Casuarina* and *Arecaeae*. The second season was loaded with pollen belonging to grasses and weeds. Of these, the principal types belonged to *Cynodon*, *Zea mays*, *Cenchrus*, *Ischemum*, *Amaranthus*, *Chenopodium*, *Xanthium* and *Parthenium*.

The third season (May-Aug & Dec - Mid Jan) was represented by the sporadic occurrence of few pollen types. During this season climatic factors influenced trapping and pollen concentration. During the rainy season, majority of slides were washed-off leaving no trapping. Similarly, storms and wind destroyed coating area of the slides leaving dust particles and hence mounting and staining of these slides was rather difficult.

In addition to pollen, fungal spores and conidia were also observed to be present in the air over Hooghly district. Considerable number of spores and conidia were trapped at all the survey sites. The most dominant types, belonged to *Alternaria*, *Helminthosporium*, *Cladosporium*, *Fusarium*, *Culvularia* and *Ascospores*. From the present data, it was observed that certain spores/conidia showed a seasonal occurrence while majority of these were trapped throughout the period. Other fungal spores/conidia which were often observed belonged to

Cercospora, *Corynespora*, *Diplodia*, *Pithomyces* *Tetrapola* and *Torula*. Certain fungal spores trapped on the slides could not be identified due to their hyaline nature and ill-defined morphological features. Along with pollen and fungal spores other airborne particles such as fragments of fungal hyphae, insect parts, plant debris and mites were also recorded.

In summary,, the airborne pollen-spore types in the atmosphere of Hooghly were recorded. A majority of them, have been identified as important allergens in other studies from the country and abroad. However, the allergen extracts prepared from them need to be tested on nasobronchial allergy patients belonging to Hooghly district and neighbouring area. The present knowledge would be helpful in selecting the antigens for diagnosis of pollen and spore allergy in local patients.

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