

**“Survey of Aeromycoflora and related Allergic diseases of
Raipur, Chhattisgarh”**

**SYNOPSIS
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Title: “Survey of Aeromycoflora and related Allergic diseases of Raipur, Chhattisgarh”

1. Introduction:

Raipur is the capital city of Chhattisgarh state in India. It is situated in between 22 degree 33' N to 21 degree 14' N Latitude and 82 degree 6' to 81 degree 38' E Longitude. The city is located centrally in the state of Chhattisgarh, and now serves as a regional hub for trade and commerce for a variety of local agricultural and forest products. The traditional face of city has changed after attaining the status of capital. The population of city has become doubled, which made a greater utilization of the resources. Raipur has been an important regional commercial and industrial destination for the coal, power, steel and aluminium industries. There are more than 800 rice milling plants, and all major and local cement manufacturing companies have a presence in the city. Increased urbanization and industrialization in recent time has made a significant impact on air quality. Varieties of biopollutants / bioparticles are suspended in the air and they are the main concern of study in recent times.

The branch of microbiology which deals with airborne bio-particles and their impact on human and living system in relation to environmental condition is known as aerobiology. Aerobiological study concerns their sources, liberation, dispersal, deposition and impact of bio particles on living organisms. The term aerobiology was introduced by Meier (1935) as collective term for the studies of aerospora like airborne fungal spores, pollen grains and other microorganisms. Nilson (1992) defined aerobiology as an interdisciplinary and limitless science. In other words aerobiology is the scientific discipline focusing on the study of the passive transport of microorganisms and particles of biological origin in the atmosphere. High interest is given to the source of microorganism or materials released in to the atmosphere, its dispersion, deposition and impact on animals, plants or human systems. It focuses on the transport of airborne microorganisms in outdoor and indoor environments. The air of the outdoor and other

environment contains a variety of biotic air pollutants. Biotic pollutants include bacteria, fungi, pollen-grains, trichomes, mites, algae and spores of bryophytes, *pteridophytes* and other particles of biological origin. These airborne bio-particles/ pollutant transported through air current and they are the main cause of human allergic disorders. Allergic disorders are caused by the bio particulate material in the environment known as allergens.

Allergen is an organic compound, containing hydrogen, oxygen and nitrogen, which form an important part of living organisms. The term allergy is used to describe a response, within the body to a substance, which is not necessarily harmful in itself, but results in an immune response and a reaction that causes symptoms and diseases in a predisposed person, which in turn can cause inconvenience, or a great deal of misery. About 12-20% of world population is known to suffer from allergic disorders such as bronchial asthma, allergic rhinitis, atopic dermatitis and urticaria etc. The magnitude of allergic problems in India is alarming as more than 10% of the population was estimated to suffer from major allergic diseases of which asthmatics constitute 1%, while allergic rhinitis is about 3-4%. The recent survey conducted through medical questionnaires from work places in Delhi has shown that workers suffered up to 60% from respiratory disorders. The preliminary reports of study on Aeroallergens and Human Health suggests 10-30% bio particles are of allergic nature. Each year the numbers are increasing by 5% with as many as half of all those affected being children. The most common allergens are Pollen from trees and grasses, house dust, mites, fungal spores, pets such as cat and dogs, insects like wasps and bees, industrial and household chemicals, medicines, and foods such as milk and eggs and the common symptoms are Sneezing, runny nose, itchy eyes and ears, severe wheezing, coughing, shortness of breath, sinus problems, a sore palate and nettle – like rash.

Amongst all the biotic pollutant, the fungal spores contribute significantly, hence the term Aeromycology was used for the study of fungal spores and parts of fungal components in the air. The allergenicity of airborne fungal spores and knowledge of their significance in the management of naso bronchial allergy has been convincingly demonstrated. The magnitude and quality of fungal spores in the atmosphere varies from season to season and year to year, and also from region to region depending on local

flora, topography, landscape and human interferences. With urbanization, man spends most of his time at indoors either at office or house, hence he is more exposed to indoor allergens than the outdoor. The knowledge of composition and incidence of fungal spores at each patient's environment helps all allergist to identify the cause for their allergy. The biopollutants in developing countries like India causing various health hazard to life of great concern for environmentalist. Connection between the occurrences of air borne allergy symptoms has been established by the elution of protein antigen in contact with mucous surface. Fungal spores gain entry into the respiratory tract of human beings with rhythmical inhalation of air through nostrils. Size, shape and surface structure of air borne fungi are important factor in the inhalation, retention and exhalation of man. The air almost always contains spores, but their number and types depends on the time of days, weather, season and geographical location.

The common *in vivo* tests generally employed for diagnosis of allergy are intradermal/skin prick test, bronchial provocation tests, ophthalmic and praushitzkustener tests. The above tests are further confirmed by in-vitro investigations such as determination of specific IgE in the sera of patients against the allergens in question. (ELISA) is also used in identification of allergenically important fractions. Several researches have observed a strong correlation between skin test and raised serum.

In light of above knowledge, it is apparent that fungal spores contribute the significant part of biopollutant/ bioparticles in air and they have long known associations with human diseases. Although many studies have described environmental conditions that lead to fungal growth. Airborne and dust containing fungi have also been described for a variety of environments, including residences, workplaces and schools; however, their clinical relevance hasn't been much studied. Therefore, the present investigation was under taken to survey the indoor and outdoor aeromycoflora which are supposed to be aeroallergens and diseases caused by them in industrially growing city like Raipur. Clinical study will also evaluate the means of treatment used against the variety of aeroallergens in which people are exposed.

2. A brief review of work already done in this field:

Aerobiological investigations have been made by the several workers in India as well as in abroad. A brief review has been given for some of the important work.

Aerobiological research in India has relatively short history. The beginning of the research is being traceable to the first systematic investigations by Cunningham (1873) in Calcutta. After a fairly long gap research work was initiated by Mehta (1940) at Agra. Kasliwal(1955) at Jaipur and Kalra (1958) at Pune had made aerobiological investigations with particular reference to allergy. Subsequently Sreeramulu (1962) conducted exhaustive investigations on varied aspect of aerobiology at Waltair. Since then work has been going on at several places like Calcutta, Agra, Mysore and Aurangabad etc. During the last 25 years several centers have taken up the work on varied aspects of aerobiology.

A new decade of aerobiological research in India started with the studies made by Lakhanpal (1958) in Lucknow and Nair (1960) at Almorah. Shivpuri (1982) had made an elaborate investigation on the airborne mycoflora and its relation to allergy in Delhi.

In Chhattisgarh, the credit for developing the aerobiological research work goes to Tiwari and his co-workers. Tiwari and Godheja (1985) reported the comparative account of airspora and phylloplane mycoflora of Brinjal at Raipur. Jadhav (1996) studied the aeromycoflora over rice field at Balodabazar. Tiwari (1999) reported aerobiological studies of Raipur with special reference to fungal spores. Ahire *et. al.* (2007) reported aeromycoflora of a play ground in Pimpri Chinchwad area at Pune. Mohture *et. al.* (2007) conducted aeromycological studies in relation to fungal allergy in semi urban area, Nagpur (M.S.). Puttaiah and Naveen (2007) studied aeromycoflora of Bhadravathi Town, Karnataka, India. Tiwari *et. al.* (2007b) reported aeromycoflora of Motibag and Nehru park at Raipur. Kunjam (2007) studied the aeromycoflora of (panabaras) Rajnandgaon district; Lall (2008) studied the aeromycoflora of Ambedkar Hospital, Raipur ; Kotwal *et. al.* (2010); Kulkarni (2011); Lall(2011) investigated the aeromycoflora of different places. Debasmita *et. al* (2011); Nafis and Sharma (2012)have studied the aeromycoflora of Metro-railway station, Delhi. Ahire *et .al.*(2012) have studied aeromycoflora of

vegetable and fruit market Pune. Lanjewar *et. al.* (2013) have studied aeromycoflora present in the indoor environment of FCI godown Tilda, Raipur.

Extensive studies on air spora have also been carried out in abroad by Pady (1951) at Kansas, USA, Ainsworth (1952), Gregory (1952), Hirst (1952) in united Kingdom, Richards (1954) in UK, Cammack (1955, 1958) in Africa, Meredith (1961) at Jamaica, West-Indies, Lacey (1962) in UK, Schenck (1968) in Florida and Suzuki (1969) in Japan. Some of the important investigations are like Bartzokas (1975) studied the relationship between the meteorological parameters and the airborne fungal spores of Athens metropolitan area; Moustafa and Kamal (1976) have investigated the fungal spore population in the atmosphere of Kuwait. Harire *et. al.* (1978) studied the airborne fungal spores in Ahwaz (Iran). Cavalo *et. al.* (1980) reported the airborne fungi in the air of Barcelona (Spain); Goretti *et. al.* (1989) studied the fungal spores of Perugia (Italy); Tan *et. al.* (1992) Studied the tropical airspora in Singapore; Talpur *et. al.* (1995) studied the aeromycoflora of Khairpur, Pakistan; Ismail *et. al.* (1999) studied airspora of Uganda; Khan *et. al.* (1999) studied the airspora of Kuwait; Sabariego *et. al.* (2000) reported the effect of meteorological factors on the daily variation of airborne fungal spores in Granada (South Spain); Irene *et. al.* (2002) reported airborne fungal spores in the campus of Ancheita; Colakoglu (2003) reported airborne fungal spores at the Belgrad forest near the city of Istanbul (Turkey); Rodolfiet *et. al.* (2003) studied the occurrence of green house microfungi in Botanical Garden, Italy; Diez *et. al.* (2006) reported fungal flora in Madrid, Spain. Falvey and Streifel (2007) conducted ten year air sample analysis of *Aspergillus* prevalence in a university hospital of Minnesota, USA.; Kasprzyk *et.al.* (2008) studied Fungal spores in the atmosphere of Rzeszow (South-East Poland), Toqueer Ahmeed *et. al.* (2009) studied the Airborne fungal flora of Karachi, Pakistan. Abatutain (2013) investigated the aeromycoflora of some Eastern provinces of Saudi Arabia.

3. Objectives:

Following are the objectives of the present study:-

1. To survey aeromycoflora of the selected indoor and outdoor area of the Raipur city.
2. To investigate the seasonal variation in aeromycoflora of the selected indoor and outdoor area of the Raipur city.
3. Ecological studies will be done in order to record the distribution pattern of aeromycoflora.
4. Identification of aeromycoflora will be done.
5. To survey the allergic diseases prevalent in Raipur city.
6. To identify an aeromycoflora born allergic diseases.
7. To study the sources, transmission and control measures for aeromycoflora and born allergic diseases.
8. To survey the clinical profile for the allergic diseases.

4. Noteworthy contributions in the field of proposed work:

Noteworthy contributions in the field of proposed work have been made by workers in India as well as in abroad. In India major Aerobiological studies has been carried out by Sreeramulu (1925-1974) in Waltiar (Visakhapatanam) , Rai (1969) in Varanasi, Agrawal (1974) in Delhi, Atturi (1981) in Vishakhapatnam, Bhagwan (1983) in Nanded , Maharashtra, Ahire (1990) in Nasik, Bhadane (1991) in Dhulia Maharashtra, Ahuja (1991) in Aurangabad, Aher (1993) in Ahmad nagar, Giri (1996) in Nagpur, Tiwari and Jadhav (1996) in Raipur, Oomachan (1999) and Bhandari (1999) in Jabalpur, Singh (2000) in Manipur, Udaya and Vittal (2003) in Chennai, Chauhan and Kulshrestha (2004) in Agra, Bebe and Singh (2005) in Manipur. Tiwari and Tiwari (2007) in Raipur, Puttaih and Navin (2007) in Karnataka, Rangaswami (2008) in Karnataka, Kotwal (2010) in Nasik , Debasmita and Naimuddin (2011) in Kolkata.

In abroad contribution in aerobiological studies have been made by workers like Streifel (1983) in France. Meier (1893-1938) in Edenburg, Gregory (1907-1986) in London, Hirst (1921-1997)in England, Curtis (2005) in Chicago, U.S.A. Falvery and

Streifel (2007) in Minnesota, Levetin (2009) in New Mexico, Abatutain (2011-2013) in Saudi Arabia.

5. Proposed Methodology:

1. Survey of Aeromycoflora:

Aeromycoflora will be surveyed in 3 indoor and 3 outdoor sites in Raipur city.

- Indoor sites: -**
1. Inside the houses
 2. Inside the commercial complexes
 3. Inside the hospitals

- Outdoor sites:-**
1. Railway station and Bus stand
 2. Vegetable market
 3. Premises of Hospitals

2. Technique:

Aeromycoflora of the selected area will be isolated on 3 petriplates / site containing PDA (Potato Dextrose Agar) medium by gravity plate technique. The petriplates will be exposed for 5-10 minutes at one meter height above the ground level at a regular interval of 15 days on the experimental site. Then the petriplates will be incubated at $26\pm 1^{\circ}\text{C}$ for 4-6 days. Identification of mycoflora will be done on the basis of microscopic study by reference books and with the help of available literatures (Ellis, 1971, Barnett, 1969, Tiwari *et al.*, 2011). For species identification microscopic slides were prepared using glycerin gel as mounting media and lactophenol cotton blue stain. Staining was done by following the method of- Prescott *et. al.* (2000) and Lall (2008).

Distribution of Aeromycoflora will be estimated as percentage frequency, density, abundance and will be calculated by following the methods of Prasad and Bilgrami, (1969); Jadhav and Tiwari, (1994).

3. Survey of allergic diseases and treatment procedure:

Prevalence of Allergic diseases and its treatment procedure will be surveyed by following means:-

- (a) By visiting major Government and Private Hospitals of the area to record the number Of patients suffers from allergic disease.

- (b) By interviewing the Doctors of these hospitals to note the treatment prescribed by them.
- (c) By visiting medical stores to record the monthly sell of drugs used in treatment of allergy developed due to fungal spores.
- (d) Demographic survey of the area, season, age and gender wise will be done to note the number , age and gender wise people suffering from allergic disease.

6. Expected outcome of the work:

Expected outcome of the work are following:-

1. Listing of Aeromycoflora in proposed indoor and outdoor sites of Raipur city could be done.
2. Seasonal variation in the Aeromycoflora in proposed indoor and outdoor sites of Raipur city could be known.
3. The results of work will enable us to enlist allergic diseases prevalent in the Raipur city.
4. Identification of Aeromycoflora born Allergic diseases could be done.
5. The findings of present work will enable us to know the source and transmission of Aeromycoflora associated with the genesis of Allergic diseases.
6. Further improvement in the treatment procedure of allergic diseases could be done.
7. Strategy for checking allergic diseases could be planned on the basis of work.
8. Outcome of the work will enable the Doctors to prescribe suitable medicine.
9. Suggestion could be made on the basis of work for further improvement in planning to control the aeromycoflora born allergic diseases.
10. Raipur city in terms of allergic diseases could be compared with other cities of the country.
11. Outcome of the present work will be helpful in organizing future research in the field.

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