



Research articles

Involvement of some allergens of plant and animal origin in allergic reactions related to respiratory system

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ABSTRACT

In India, the prevalence of allergic responses and bronchial asthma is on the rise, which is a major public health concern. Increased exposure to an allergen, a substance that causes a reaction, can cause allergy sensitization in genetically vulnerable people. Continued exposure to allergens can raise the risk of allergic diseases which can further progress into life threatening respiratory diseases. Allergic reactions to a variety of indoor and outdoor allergens play a key role in severe breathing disorders such as asthma and chronic obstructive pulmonary disease (COPD). There are distinctive kinds of allergens like animal proteins and animal dander, pollen, food, fungi, mould, Insects, Bird droppings and many others. The common allergens that cause respiratory difficulties have been identified after an honest effort. A modest retrospective analysis of 160 patients was done. Their medical history was gathered in order to determine whether or not they had been exposed to allergies in the past. All of the study participants were given a Skin prick test (SPT) with a variety of allergens, and their allergy status was evaluated based on the results. Most allergens, such as dust mites, pollen grains, and pigeon droppings, have been discovered to cause severe respiratory allergies, which can lead to life-threatening respiratory complications

Keywords: Allergens, Allergy, Asthma, Respiratory System, Skin Prick Test

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INTRODUCTION

Globally, the Respiratory allergy is big public health issue. Internationally, the growing incidence of allergic reactions and allergic illnesses are extensively identified. Allergen plays a crucial role in onset of Allergic diseases. There are variety of allergens are responsible for allergic diseases like pollen grain, animal dander, House dust mites, grass allergens etc. Because of their morbidity, prevalence, and impact status of life they constitute a major Health problem ^[1]. Pollen grain and house dust mites are most common allergens. Many patients show sensitivity to various allergens as a result of multiple allergic responses or due to occurrence of allergens. From several studies, it was observed that allergens play a critical part in the onset of allergic reaction which can further progress into life threatening complications like asthma and COPD ^[2]. Most allergens, such as dust mites, pollen grains, and pigeon droppings cause severe respiratory allergies, which can lead to life-threatening respiratory complications ^[3].

STUDIES CONDUCTED ON ALLERGEN

A. Pollen Allergens Bermuda grass

One of the main sources of allergy is Grass pollen. The allergic protein of BGP, JGP and PGP are reported trigger for upper airway allergic inflammation. The pollen released from Bermuda grass during late spring to early summer are major inhaled allergens in Asia and Europe which are responsible for onset of cough, wheezing or rhinorrhea and also reduced the quality of life in asthma patients ^[4]. Recently collected data from Argentina showed that 48.1% of patients who suffered from seasonal allergies were show sensitization to Bermuda grass pollen. In Thailand, the Bermuda grass pollen positive rate was 21.1 % in allergic patients. Above finding showed that Bermuda grass allergens plays an important role in development of allergic reaction which can be progress into allergies respiratory diseases. Based on above Evidence we also selected Bermuda grass allergens for our study ^[5].

Corn

Maize belongs to the circle of relatives of and it's also an

allergen supply in modern nutrients. Allergic reaction caused due to maize is because of protein present in maize kernels. One of the chiefs identified protein in maize is Zea m 14 which is a heat resistance lipid protein having molecular weight of 9 which are responsible (IgE) mediated immune response [6]. Maize kernels and maize pollens contain some same allergens. Following protein has been identified allergens from the zeo maize. They are zeo m 1, zeo m 2, zeo m 3, zeo m 12 and zeo m 13. The study conducted on 40 patients revealed that, Out of the forty sufferers, 14 Patients had unique IgE antibodies in opposition to pollens allergens, out of 14 sera in 2 sera specific IgE were observed to maize pollen [7].

English plantain

English plantain is a remarkably sizeable species local to Europe, North Africa, and parts of Asia. English plantain pollen is responsible for allergic rhinitis (hay fever) and allergic conjunctivitis. English plantain hypersensitive reaction signs and symptoms can be much like many other pollen hypersensitive reactions and might include: sneezing, nasal congestion and runny nose [8, 9].

Peltophorum pterocarpum (pp)

One of the most critical reasons of respiration hypersensitivity in India and some other place are distinctive plant pollens. The various crude plant allergens extract are used for the prognosis and in monotherapy of sufferers affected by breathing allergies. Microscopic observations imply that pp pollen has a tricolporate aperture and reticulate ornamentation. The survey performed in Calcutta and its suburbs suggested that plant pollens grains revealed to cause 14% to 23% sensitization in respiratory allergic instances with phenomenal pores and skin reaction. Affected person population, pores and SPT and series of sera pores and skin assessments have been done with pp pollen grains on 2,746 persons with respiration allergic reactions sufferers (age variety, 18-55 years; forty nine% male and 51% woman) showing the allergic reaction. Unit of the Institute of Child Health, Calcutta, observed that all of them had manifested clinical observations of occasional rhinoconjunctivitis or asthma. A majority of these patients noted to having pp timber growing of their place. Distinct records, inclusive of age, own family records and commencement and span of symptoms, have been observed [10-12].

Prosopis juliflora

P. juliflora a medium-sized tree own family fabaceae that which been introduced round the arena. Several researchers have identified that pollens from plants can initiate respiration troubles. This plant extracts have 16 allergenic additives of which nine proteins had been identified as principal allergens with a number of them display pass-reactivity [13-14].

Magniflora indica

Plant pollen is one of the maximum not unusual reasons of

seasonal allergic disease global huge. On this take a look at the extraction, purification, fractionation of mango flower protein were done and the homogeneity was confirmed mfpp sds-page which showed single band. Pectate lyase (pel) activities were showed by mfpp. The yield of mfpp was 10% of the overall protein from aqueous extract of the pollen, whilst its allergenic property becomes approximately 44% tested via blood checks. Consequently, the existing examine demonstrates that extracted protein from mango flower pollen has allergic consequences on animals [15-16].

Wheat

Occupational allergies debts for extra than 10% of all cases of bronchial asthma in adults, and baker's asthma (ba) is the leading reason of occupational breathing sickness in western international locations. One study conducted for Bakers Asthma on grocery store and bakery workers in Spain showed that maximum study enrolled patients showed positive SPT for wheat allergens [17-18].

Chenopodium album

Goosefoot (*Chenopodium album*) is a wind-pollinated, annual plant that typically grows to a peak of around zero.1-1.5 m. This species originate from Eurasia; however, it's far presently naturalized all over North USA [19]. The pollen from this plant can set off allergic conditions such as conjunctivitis, allergic rhinitis, and allergies. Goosefoot weed pollen allergens chef a 1, che a 2, and che a three had been diagnosed and listed in the IUIS database. Goosefoot pollen exhibits go-reactivity with different members of the Chenopodiaceae circle of relatives, alder, birch pollen, black locust, lilac, sugar beet, timothy grass, and olive. Pollen from wind-pollinated flowers like has been discovered to be one of the principle members of IgE derived type- I allergic situations like asthma, allergic rhinitis, and conjunctivitis. A study performed on 179 pollen-sensitized patients (nine to 69 years) in Spain pronounced rhinoconjunctivitis in 29% of patients and 70% of the sufferers with both asthma and rhinoconjunctivitis. Spt -mediated sensitization profile revealed 65.9% (118/179) of the study population to be sensitive towards goosefoot. An Iran-based cross-sectional study conducted on 187 asthmatic patients mentioned a giant ($p=0.003$) correlation among sensitivity toward goosefoot pollen and asthma severity [20,21].

Fungi Allergens

Alternaria alternata

Vulnerability to the fungus *A. alternata* is a threat aspect for respiratory disorders. *A. alternata* is one of the maximum commonplace fungi related to allergies not only responsible for onset of asthma additionally staying power and increases the severity of asthma have been strongly associated with exposure to *A. alternata* [22]. Even though publicity to *Alternaria* is an important chance thing for asthma, scanty studies have recorded exposure to this fungus in inside habitat a *alternata*, a sophisticated saprophyte mainly located in

soil and flowers, is usually taken into consideration an outside irritant. The various studies conclude *A. alternata* may cause respiratory allergies [23,-24].

Botrytis cinerea

B. cinerea has an international distribution and is located frequently in soil [25]. Study conducted in Chicago examine a group of 39 patients suffered from allergic rhinitis with imagined mildew allergy. Out of 39 study subjects 44% had been showed large quality to mould test panel, Increased in Serum-unique IgE against *B. Cinereas* were observed in 28.2% study subjects. The study conducted on 10 American patients showed that the patients with allergic fungal sinusitis 50% have been SPT showed effective for *B. cinerea* [26, 27].

Fusarium moniliforme

Reference fusarium species are vital plant pathogens causing numerous sicknesses. They will once in a while purpose infection in animals. In humans, *Fusarium* species cause an extensive range of infections inclusive of superficial (consisting of keratitis and onychomycosis), locally invasive infections were observed in immunocompromised patients. *Fusarium* species may also cause allergic illnesses (sinusitis) in immunocompetent people and mycotoxicosis in people and animals. It is one of the important allergens responsible for respiratory allergy [28, 29].

C. Dust Mites

Dermatophagoides fairance and Dermatophagoides pteronyssinus

Residence dirt mites, *D. farinae* and *D. pteronyssinus*, are critical additives inside the improvement of asthma Breathing allergies, specifically allergic rhinitis and asthma, are among the most commonplace allergic reactions in industrialized areas. Residence dust more maximum prevalent allergens that cause allergic respiration disorders. *D. pteronyssinus* (der p) and *D. farinae* (der f). The intention of the take a look at changed into to evaluate the sensitization to der p and der f in our people with respiration hypersensitive reactions. The analysis protected 93 sufferers with perennial rhinitis and/or allergies and effective skin sensitivity to dirt mites. 81 % of the tested patients sensitized to der p. Showed conjoined sensitivity to der f. The equal content reactions to each mite were discovered in 34% of sufferers. 39% of patients show massive urtica diameter. 10% showed more reactivity to reaction der f than to der p. Sufferers with breathing hypersensitive illnesses and pores and skin reactions to dirt mites in the study population were sensitized to der p and der f 97%:84% [30-33].

Blomia tropicalis

Blomia tropicalis is a mite that belongs to the super family of glycyphagidae. Initially defined as a garage mite, it's far now taken into consideration as a residence dirt mite of tropical and sub-tropical regions. Moreover, this globule-shaped mite turned into especially

determined in garage centres for grains and as contamination of processed food made from grains. Airway inhalation is the main direction of exposure to hdms the inhalation of mite fecal particles has mentioned eliciting allergies in sensitized individuals. The mite fecal allergen, after being inhaled, reduces the mucociliary clearance, which in turn will increase the deposition of inhaled debris, causing allergic sensitization [34-35].

Acarus siro (store mite), Lepidoglyphus Destrescentiae and Tyrophagus putrescentiae

Beside pyroglyphid mite the other storage mites like (*D. pteronyssinus* and *D. Farinae*), many other mites, typically known as reasons for allergic symptom. More recently, research had been concentrate on the influence of SM allergic reaction in no occupationally unprotected topics. In United States of America, the sensitization of SM in person allergic to hdms ranged from 28% to 62 % which is depends on species studied and methods used. The more regularly disclosed species of SM was *Destructor* [36-38].

D. Mould Allergens

Penicillium notatum

Penicillium has long been recognized as one of the moulds most customarily producing effective pores and skin test reactions in allergic people. Inhalation of *Penicillium* spores in portions comparable with those encountered by using natural exposure can result in each immediately and late bronchial asthma in sensitive men and women [39]. *Chrysogenum* is a common *Penicillium* allergens are main indoor irritants and that they had been related with sick building syndrome additionally. By observing reactivity with IgE antibodies in sera of the asthmatic patients *Chrysogenum* protein have been recently described as irritants. Animal studies with *Chrysogenum* showed that viable conidia instilled intra-nasally can induce hypersensitive responses [40].

Rhizopus higricans

R. higricans is the fungus generally known as bread mildew, and is the maximum ordinary species of *Rhizopus* [41]. Pulmonary characteristic changed into observed in 66 wooden trimmers who came in contact to organic dust (moulds) after a 30 days of no exposure after which 3 and 27 months later, and also in the course of a running week. The FVC and forced in a single 2d (fev1) were decreased via an average of 0.4 and 0.31 respectively after 30 Days no publicity. Assessment after 3 months later, after days of no exposure, proved a further devaluation in fvc and fev1. In addition, recordings 27 months later showed no further damage to lung capabilities. Deterioration had been greater apparent at a sawmill with more air concentrations of organic dust [42-43].

E. Other

Bird - Pigeon Dropping

Allergic reactions to pigeon feces are common. The dirt of dried droppings causes irritation to irritate the nasal passages

responsible for sneezing, coughs, excessive mucus and shortness of breath^[43]. Consequently exposure to pigeon allergens in the surroundings has led to boom in hypersensitivity reactions because of pigeon proteins present in their feathers and droppings. Exposure to dust from the pigeon loft can reason heterogeneity of diseases consisting of allergies, ornithosis, (microbial infections of birds which may be transferred to humans), lung irritation from inhaling irritant dusts. Allergic proteins are discovered in chook droppings and feather blooms Few research have shown that pigeon droppings are important source of antigen in particular in environmental ^[44]. Secreted IgE antibody are main protein antigen and intestinal protein mucin is the important carbohydrate antigen, the presence of immunoglobulin g (IGG) antibodies in symptomatic humans and allergic reaction response suggest complex immune mechanisms^[45, 46].

Animals - Cat epithelia

The sensitization to dogs and cats differ by us risk time and susceptibility to atopy. 26% of European adults coming to the health facility for uncertain allergic reaction showed sensitivity to cats and 27% to puppies. The increasing existence of cats and puppies in houses, has contributed to an allergic diseases^[47-49].

Insects - Cockroach

The cockroach is one of the most commonplace resources of indoor irritant. Globally 40%-60% of patients with asthma possess IgE antibodies to cockroach allergens. In Korean houses, four cockroach species have been discovered of which the maximum generally confront is the German cockroach ^[50]. Modest retrospective analysis of 160 patients was done. Their medical history was gathered in order to determine whether or not they had been exposed to allergies in the past. All of the study participants were given a skin prick test with a variety of allergens, and their allergy status was evaluated based on the results. Most allergens, such as dust mites, pollen grains, and pigeon droppings, have been discovered to cause severe respiratory allergies, which can lead to life-threatening respiratory complications^[51, 52].

MATERIAL AND METHOD

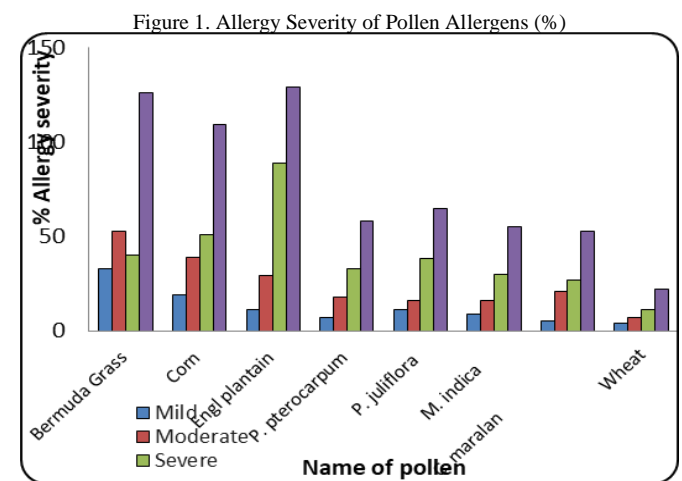
A retrospective data from 160 patients (Age above 40, both Male and Female) was collected to establish the correlation between allergens and respiratory allergies. The study conducted at Sai Netralay and Speciality Clinic, (Allergy, Asthma and Eye Hospital) Pune. The study protocol was approved by Royal Pune Independent Ethic Committee, Pune. (IEC protocol approval number-RPIEC0160121). Patients medical history was gathered determines whether or not they had been exposed to allergies in the past. All of the study participants were given a skin prick test with a variety of allergens, and their allergy status was evaluated based on the results. All patients enrolled in study signed inform consent.

A study involved various allergens pollen grain like Bermuda grass, Corn, Engl plantain, Peltophorum pterocarpum, Prosopis juliflora, Magniflora indica, Chenopodium maralan and Wheat. Various Dust Mites allergens Dermatophagoides fairance, Dermato pteronyssinus, Blomia tropicalis, Acarus siro, Lepidglyphus destrescentiae and Tyrophagus putrescentiae. The study involved fungi allergens like Alternaria alternata, Botrytis Cinerea and Fusarium moniliforme. Mould allergens Penicillium notatum, Rhizopus higricans and the other animal, bird and insects allergens like Cat epithelia, Cockroach and Pigeon dropping.

RESULT

Pollen Allergens

Out of 160 patients 126 patients were suffered from Bermuda grass allergy. Out of 126 patients 33% patients suffered from mild allergy, 53% patients suffered from Moderate allergy and 40% patients suffered from severe allergy. Out of 160 patients 109 patients showed Corn allergy. Out of 109 patients 19% patients showed Mild allergy, 39% Showed moderate allergy and 51 % patients showed severe allergy to corn allergens. Out of 160 patients 129 patients showed Engl plantain allergy. Out of 129 patients 11% patients showed Mild allergy, 29% Showed moderate allergy and 89 % patients showed severe allergy to Engl plantain allergens. Out of 160 patients 58 patients showed Prosopis Juliflora allergy. Out of 58 patients 11% patients showed Mild allergy, 18 % Showed moderate allergy and 33 % patients showed severe allergy to Engl plantain allergens. Out of 160 patients 38 patients showed Magniflora indica allergy. Out of 38 patients 11% patients showed Mild allergy, 16 % Showed moderate allergy and 21 % patients showed severe allergy to Magniflora indica allergens. Out of 160 patient's 22 patients showedWheat allergy. Out of 22 patients 4% patients showed Mild allergy, 7% Showed moderate allergy and 11 % patients showed severe.

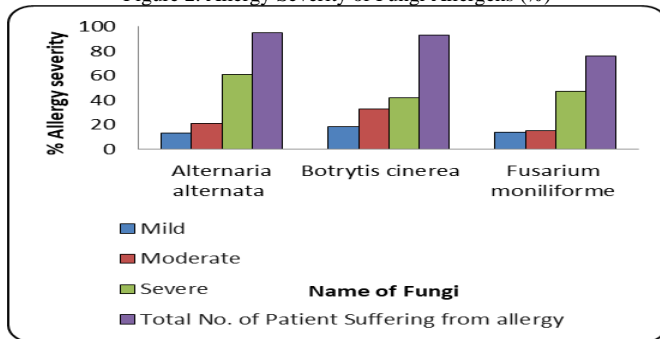


Fungi Allergens

A study involved various fungi allergens like Alternaria alternata, Botrytis Cinerea and Fusarium Moniliforme. Data from 160

patients were collected. Out of 160 patients 95 patients were suffered from *Alternaria alternata* allergy. Out of 95 patients 13% patients suffered from mild allergy, 21% patients suffered from Moderate allergy and 61% patients suffered from severe allergy to *Alternaria alternata* allergens. Out of 160 patients 93 patients showed *Botrytis Cinerea* allergy. Out of 93 patients 18% patients showed Mild allergy, 33% Showed moderate allergy and 42 % patients showed severe allergy to *Botrytis Cinerea* allergens. Out of 160 patients 76 patients showed *Fusarium Moniliforme* allergy. Out of 93 patients 14% patients showed Mild allergy, 15% showed moderate allergy and 47% patients showed severe allergy to *Fusarium Moniliforme* allergens.

Figure 2. Allergy Severity of Fungi Allergens (%)

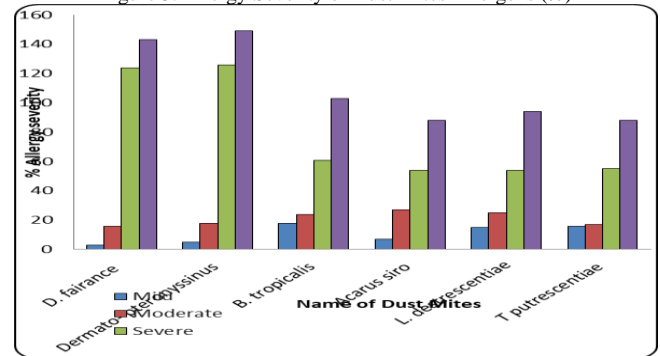


Dust Mites Allergens

A study involved various Dust Mites allergens *Dermatophagoides fairance*, *Dermato pteronyssinus*, *Blomia tropicalis*, *Acarus siro*, *Lepidglyphus destrescentiae* and *Tyrophagus putrescentiae* dust mites allergens. Data from 160 patients were collected. Out of 160 patients 143 patients were suffered from *Dermatophagoides Fairance* allergy. Out of 143 patients 3% patients suffered from mild allergy, 16% patients suffered from Moderate allergy and 124% patients suffered from severe allergy *Dermatophagoides fairance* allergens. Out of 160 patients', 149 patient's showed *Dermato pteronyssinus* allergy. Out of 149 patients 5% patients showed Mild allergy, 18% showed moderate allergy and 126 % patients showed severe allergy to *Dermatophagoides Fairance* allergens. Out of 160 patients, 103 patients showed allergy to *Blomia tropicalis*. Out of 93 patients 14% patients showed *Blomia tropicalis* allergy. Out of 103 patients 18% patients developed mild allergy, 24% showed moderate allergy and 62% patients showed severe allergy to *Blomia tropicalis* allergens. Out of 160 patients, 88 patients Out of 160 showed *Acarus siro* allergy. Out of 88 patients, 7% patients showed mild allergy, 27% showed moderate allergy and 57% patients showed severe allergy to *Acarus siro* allergens. Out of 160 patients, 94 patients receiving *Lepidglyphus Destrescentiae* showed allergy. Out of 94 patients, 15% patients developed mild allergy, 25% showed moderate allergy and 94 % patients showed severe allergy to *Lepidglyphus destrescentiae* allergens. Out of 160

patients, 88 patients with *Tyrophagus putrescentiae* showed allergy. Out of 88 patients 16% patients developed mild allergy, 17% showed moderate allergy and 55% patients showed severe allergy.

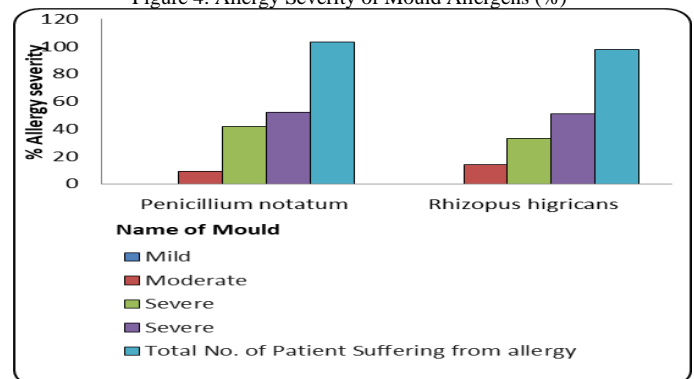
Figure 3. Allergy Severity of Dust Mites Allergens (%)



Mould Allergy

A study involved various Mould allergens *Penicillium notatum* and *Rhizopus higricans*. Data from 160 patients were collected. Out of 160 patients 103 patients were suffered from *Penicillium notatum* allergy. Out of 103 patients 9% patients suffered from mild allergy, 42% patients suffered from Moderate allergy and 52 % patients suffered from severe allergy to *Penicillium notatum* allergens. Out of 160 patients 98 patients showed *R. higricans* allergy. Out of 98 patients, 14% patients showed *Blomia tropicalis* allergy. Out of 103 patients, 18 % patients showed mild allergy, 33% showed moderate allergy and 51% patients showed severe allergy to *Rhizopus higricans* allergens.

Figure 4. Allergy Severity of Mould Allergens (%)

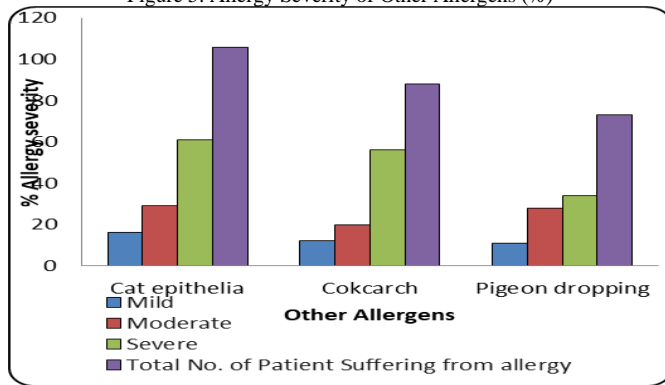


5. Other Type of Allergy (Bird, Animal and Insects)

A study involved other animal, bird and insects allergens like Pigeon Dropping, cat epithelia and Cokcarch. Data from 160 patients were collected. Out of 160 patients, 106 patients were suffered from Cat epithelia allergy, 16% patients suffered from mild allergy, 29% patients suffered from moderate allergy and 61% patients suffered from severe allergy to a Cat epithelia allergen. Out of 160 patients 88 patients were suffered from Cokcarch allergy. Out of 106 patients 12% patients suffered from mild allergy, 20% patients suffered from moderate allergy and 56% patients suffered from severe allergy to Cokcarch allergens. Out of 160 patients, 73 patients were suffered from Pigeon Dropping allergy. Out of 73 patients 11%

patients suffered from mild allergy, 28% patients suffered from moderate allergy and 34 % patients suffered from severe allergy to Cokcarch allergens.

Figure 5. Allergy Severity of Other Allergens (%)



DISCUSSION

In India, the superiority of allergic responses and bronchial asthma is increasing on the rise that is a prime public fitness problem^[53]. Elevated exposure to an allergen, a substance that reasons a response, can motive hypersensitivity sensitization in genetically susceptible humans. Endured exposure to allergens can raise the hazard of asthma and different allergic illnesses. Allergies spread by indoor and outdoor allergens play a key role in extreme breathing issues which include bronchial asthma and COPD. There are extraordinary styles of allergens like Pollen grain, Dust mites, Animal Dander, Animal protein insects, animal proteins and animal dander, dust, drugs food, animal venom, herbal rubber latex, and many others^[54]. The commonplace allergens that cause breathing problems were diagnosed after a sincere effort. An allergen is a substance that may cause hypersensitivity. In a few human beings, the immune device acknowledges allergens as foreign or dangerous. As a result, the immune machine reacts through creating a type of antibody known as IgE to defend against the allergen. This response ends in hypersensitivity signs.

Allergen performs an essential function in development of allergic diseases. There are variety of allergens are answerable for allergic diseses like pollen grain, animal dander, residence dust mites, Grass allergens and so on^[55]. In industrialized location respiration allergies, specifically allergic rhinitis and allergies are the commonplace sort of allergies. Because of their morbidity, prevalence, and effect on fine of life they represent a primary health issue of all allergens which could elicit respiratory allergies grass pollen and residence dust mites had been recognized as extra commonplace allergens ^[56]. Many patients display sensitivity to numerous allergens, as a result of multiple allergic reactions or due to prevalence of pan allergens ^[57]. Recently conducted studies showed that exposure to various environmental allergens plays a key role in development of allergic respiratory diseases. The

prevalence of allergic respiratory diseses is increased as the exposure to various indoor and outdoor allergens increases. One study conducted on Farmers showed that microbial and dust exposure of farm related work were responsible for hypersensitivity pneumonitis. Another study showed that Allergic respiratory diseases and climate change showed direct influence on meteorological factors as well as interactions between meteorological factors, air pollutants and allergens affect the development and severity of allergic respiratory diseases. In our study, it was observed that the study subject had a history of respiratory allergy ^[58]. They were suffered from various respiratory allergy symptoms like runny nose, shortness of breath, cough etc. which may indicate development of respiratory disorders. The SPT results showed that they were allergic to various study allergens. Results of allergic severity showed that, most of the patients showed severe allergy to almost all of the allergens. Result indicted that continuous exposure to indoor or outdoor allergens may responsible for allergic symptoms which can further progress into respiratory diseases like Asthma and COPD. Further Spiro metric and lung function evaluation may need for more accurate result.

CONCLUSION

In conclusion, from above study it was observed that exposure to allergens triggers a series of allergic reactions which can further progress into Severe Respiratory Disease. Avoidance of allergens exposure may decrease the onset of respiratory diseases.

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