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House Dust mites and allergic diseases

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Report Submitted to fulfill the requirements for Scientific Research Activity

Date of Submission:3/10/2020

Abstract:

One of the important ingredients in house dust is mites because it is able to perform many allergic symptoms, therefore in this study, quality and quantity of indoor dust mites was evaluated at the residence of 150 atopic allergic patients from four different districts of India. suspected patients with a history of allergic diseases were selected in this study. Dust samples (500 mg) were collected from the selected patient's house and were analysed using standard methods. About 60% of the selected patients were found suffering from respiratory disorders and rest 40% from skin allergy. The dominant mites recorded from indoor dust samples were Dermatophagoides followed by Blomia, Acarus, and Cheyletus while Caloglyphus was recorded in least number. The distribution of mites on the basis of housing pattern indicates that RCC type of buildings supports maximum dust mite's population followed by Assam type (semi-RCC) buildings, and the lowest count was observed in wooden houses. Environmental factors like temperature, rainfall, and relative humidity are found to determine the indoor mite's population. Severity of allergic attack in some of the typical cases was found to be proportional to the allergen load of mites in the dust sample Dust mites are small creatures related to ticks, chiggers, and spiders that board on mattresses, bedding, upholstered furnishings, carpets and curtains. Entrance or even skin contact with these organisms might be involved in the pathogenesis of allergic diseases.

Introduction:

One of the most strongly allergenic components of house dust, often heavily contaminated with the fecal pellets and cast skins, is house dust mites [1]. House dust mites are tiny creatures related to ticks, chiggers, and spiders that live in close association with humans. Their primary food is dander (skin scales) shed from human and pet activity [2]. Estimates are that dust mites may be a factor in 50 to 80 percent of asthmatics, as well as in countless cases of eczema, hay fever, and other allergic ailments. Symptoms are usually respiratory in nature (sneezing, itching, watery eyes, wheezing, etc.); however, there are reports of a red rash around the neck. Other allergic reactions may include headaches, fatigue, and depression [3]. Inhalations of dust mite allergens by hypersensitive individuals can result in acute attacks of bronchial asthma, accompanied by wheezing, shortness of breath, and perhaps even death. Diagnostic tests and clinical studies by allergists have shown house dust mite to be the most common allergy in asthmatics, and an important "root cause" for the development of asthma in young children. Recent studies suggest that at least 45 percent of young people with asthma are allergic to house dust mites. Unlike "seasonal" allergies caused by molds and pollen, people who are allergic to dust mites often will have symptoms year round [4]. Allergologist and aerobiologists have increasingly recognized the role of house dust mites in inducing allergy. However, clinical investigations of house-dust mite allergy in tropics are few [1, 5–7]. The significant role of mites in the house dust responsible for health hazard such as respiratory allergy, nasobronchial, nasal, and skin allergy in sensitive individuals is well documented. Group 1 allergens of the mites Dermatophagoides farinae (Der f1) and Dermatophagoides pteronyssinus (Der p1) are the most significant allergens; 80% to 95% of patients allergic to dust mites have an elevated IgE response to them [8].

Aim

This report is made in order to cover the effects of house dust mites in allergic diseases patients. .

Methods

The data was collected from an Indian study regarding house dust mites were selected from the residence of 150 atopic patients to record the diversity and

abundance of mites in floor and bed dust samples, only those patients who were having case history of allergic diseases (i.e., respiratory and skin allergic diseases) were selected for present study ,Patients were categorized according to age, sex, symptoms, housing patterns, of the total population selected, 47% were living in RCC type buildings (buildings with concrete wall, floor, and roof), 39% in assam type (semi-RCC buildings having roof made of tin metallic element) buildings, 13% in bamboo house, and rest 7% in wooden houses, in addition for that patients were selected to classify the grade of allergy attack as it shows in (table 1) :

Group 1	Occasional skin allergy attack
Group 2	Frequent skin allergy attack
Group 3	Occasional respiratory allergy attack
Group 4	frequent respiratory allergy attack

Sex wise: 73% of the selected patients were male and 27% were female [(2)].

Five hundred milligrams (500 mg) of the indoor house dust sample were collected from both the floor and bed of the selected patient's house . Dust sample was collected manually and then placed in autoclave plastic container. Large particles and fibrous materials in the dust were separated by sieving through 300 mess brass sieve of 6 mm diameter. Mites were isolated from the dust sample manually with the help of a painting brass and their presence was confirmed by examining them under the microscope, their identification was done with the help of reference slides and literatures available. Mites types were categorized on the basis of genus, species, and their gender[(2).]

Results

About 60% of the patients were reported to be suffering from respiratory allergic disorders and the rest of them (40%) having skin allergy [(2)]. Distribution of mites in the dust samples collected from different houses: maximum mite population was recorded in samples collected from RCC types of building (46%) followed by Assam type semi-RCC building (36%), bamboo house was (11.3%).The lowest population was found in the dust sample collected from wooden house which represented (6%)[(5).]

Acarus, Blomia, Cheyletus, and Dermatophagoides were the dominant genus found in RCC type building, while in Assam type building, Acarus and Dermatophagoides were recorded maximum. Bamboo house showed Acarus, Blomia, and Cheyletus while wooden house showed Acarus and Dermatophagoides as common dust mite (shown in table 2).

Table 2: Distribution of mites in the dust samples collected from different houses of South Assam

House type	No. of patients (%)	Mites population	Dominant genus
RCC	69	3574	Acarus, Blomia, Cheyletus, Dermatophagoides
Assam Type	55	2848	Acarus, Dermatophagoides
Bamboo house	17	786	Acarus, Blomia, Cheyletus
Wooden house	9	343	Acarus, Dermatophagoides

Six different genus of house dust mites were identified in this study, 38.7% were male and 27.9% were female, while 33.3% of the dust mites could not be categorized due to indistinct structure(1). The dominant genus was Dermatophagoides spp. (2341), followed by Blomia spp. (1936), Acarus spp. (1686), and Cheyletus spp. (671), Acarus, Blomia, and Dermatophagoides were found dominant in several house dust and identified at different concentration [(2)].

Among Dermatophagoides, D. farinae (849) followed by D. pteronyssinus (733) was found to be the dominant species. Similarly, A. Siro and B. tropicalis were the identified species of the genus Acarus and Blomia, severally.[(2)]

About twelve percent of the patients showed higher mites population within the bed sample as compared to the ground dust and therefore, the rest eighty-eight percent of patients showed higher mites concentration within the floor dust[(2).]

An Allergen load of mite in the dust samples collected from the patient's house was found to be proportional to the severity of allergic attack in some of the typical cases.

G3 level of severity was recorded in maximum number of cases (73 cases) followed by G1 level (42 cases). G2 and G4 cases were less in number (18 and 17 cases, resp.)

About 35% of patients with severity level G4 showed an increased number of dust mites (greater than 100 mites / 500 mg of dust sample). Likewise, 8% of patients with a severity level G3 were found to have more than 100 mites count / 500 mg dust samples, and maximum number of dust mites were recorded in houses of patient suffering from frequent respiratory allergy attack [6,7]

Discussion:

prevalence of Dermatophagoides, Blomia, and Cheyletus in dust samples are well reported from different parts of the worlds. Among the different genus of dust mites recorded, Dermatophagoides, particularly D. farinae and D. pteronyssinus, are known to be highly allergenic to susceptible person, in addition Dermatophagoides farinae has identified as a causative agent in bronchial asthma. Dust mites live in close association with human, because their primary food is dander (skin scales) shed from human and pet activity [(9).]

Several studies support a genetic predisposition to asthma and also to get IgE sensitized to HDM allergens. The susceptibility loci to HDM sensitization include alleles in the major histocompatibility complex (MHC) and other out-of-MHC genes. Since the distribution of susceptibility alleles differ among human populations, we may expect that some groups will be more affected by global changes in HDM exposure. Migration studies have revealed that East Asian populations may be more susceptible to allergy and especially to HDM sensitization. Some African-descent populations have also shown susceptibility alleles for increased IgE levels that are of relevance in HDM responses. It is thought that global environmental changes will modify the distribution and allergenicity of HDMs, which may increase HDM sensitization by allowing new contexts of HDM exposure. These increased rates will be in part explained by individuals with an “underlying” predisposition that become newly-HDM sensitized. On the other hand, there are protective alleles that may render some individuals non-affected by new HDM exposure. The context of exposure will also be critical in determining susceptibility because mite allergen levels mediate gene-environment interaction

About 60% of the dust mite population is reported from the bed, mattresses, and pillows, 30% in upholstery, and 10% in carpet .The concentration and varieties of mites in the dust samples collected from selected patients house were found to vary from indoor to indoor, which could be due to the difference in the structure and materials of the buildings, socioeconomic standing of the people, type of mattresses used, standard of hygiene maintained, and difference in the microclimatic conditions that contributes to the higher accumulation of mites within house dust[8,9].

Routine human activity such as house cleaning, walking or playing on carpeting, or making the bed, causes the tiny dead/live mites or fecal particles to become airborne and inhaled this lead to several respiratory allergic symptoms such as (sneezing, itching, watery eyes, wheezing,) [5,6] .

Earlier studies have largely included individuals with a high risk for atopic diseases. Few data have been available on the association between exposure to mites and occurrence of atopic disease in general populations. The effects of mite exposure among general populations are expected to be different from those among genetically predisposed and is an important issue to be taken into consideration insofar as the majority of children with asthma appears to come from low-risk families [4]

As recorded in the present study, higher mites population is encountered during the summer and early autumn months. Mites population are generally recorded maximum during the rainy seasons, but their effect are found maximum during the dry and cooler months of the year.

Conclusion:

Mite positive patients had aggravation of respiratory allergic symptoms in the colder months when mites were dead and had disintegrated to dust . Patients allergenic to house dust had aggravation to allergic rhinitis and asthma in the fall months.

Future Work

Physical interventions (namely, steam cleaning plus vacuuming and vacuuming alone) offer practical, effective means of reducing house dust mite allergen levels in low-

income, urban home environments ,Change in dwelling accompanied by treatment gives the patient better relief in mite's allergic patients.

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