Knowledge on Association of Clinically Proven Allergy with Pets at Home- A Survey

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Abstract: Introduction: Rearing animals and birds at home are in practice in all cultures in the world, many families have a variety of pets. Pets are emotionally connected to family. Many pets have moved from outdoor protectors to indoor family members. When there is a high prevalence of pet keeping, pet allergens are also found relatively in higher concentrations. Humans are exposed to different kinds of allergy at least once in their lifetime. Some studies have shown that the frequency of allergic diseases has increased. Pet keeping was considered to be one of the risk factors for allergy development. Exposure of pet allergens in sensitive people causes diseases.

Materials and method: An online and offline survey was conducted among 53 pet keeping people. The data was collected, analyzed, and results were tabulated.

Results: In this study, the results show 67.9% of the population participating have pets at home. 86.8% of the population have mostly dogs at their home. 52.8% of participant’s pets are staying outdoors.

Conclusion: Animal danders are proved to be allergic to many clinical conditions. The study aims to associate allergy and having pets at home.

Keywords: Pets, allergy, allergen, factors, genetics, comorbidity factors.

INTRODUCTION

Allergy is a damaging immune response or exaggerated immune response of the body to a substance such as food, pollen, fur, dust, which becomes hypersensitivity reaction. In most cases, the response is inherited or can be called familial. The allergens which cause allergy can be present both indoor and outdoor. The indoor allergens are house dust, mold spores, pollen, fabrics, dust mites, cockroaches, and mainly due to pets, from animal hair, fur, and feathers. Humans are exposed to different kinds of allergies at least once in their lifetime. Animal allergy is defined as a normal immune reaction to the proteins present in pets. Pet keeping is considered to be a major risk factor for allergy development. Many families in the world have different varieties of pets, especially furry (Podberscek, Paul and Serpell, 2005). Canis lupus familiaris (domestic dog) and Felis catus domesticus (domestic cat) are the two commonly adopted domestic pets in India. The common allergens derived from them are Can f1 and Fel d1 respectively. The other animal allergens are mite- Der f1 and Der p1. Majority allergens belong to the same protein family (Lodge et al., 2012). The proteins are secretoglobin, lipocalins, and kallikreins (Nilsson, van Hage and Grönlund, 2014). Cat allergen Fel d1 belongs to the protein secretoglobin and more than 50% of furry animal’s allergens belong to the family lipocalins (Díaz-Perales et al., 2013). The allergens are present in skin, saliva, urine, sebum, peripheral gland secretions, dander, and other secretions of the pets. The frequency of allergic diseases has been increased (Platts-Mills, 2015). An allergic reaction occurs after the pet exposure when there is a reaction between the pet allergen and human immune responses (Dharmage et al., 2012). This causes a hypersensitivity reaction. The allergens are aerosolized and suspended in ambient air (Arbes et al., 2004). It also gets transmitted by clothing and with direct contact with pets (Wood et al., 1998). They also get transmitted from the bedding when the pets are not restricted to one place. The outdoor pet allergens are found in public places such as schools that are considered to be a second-hand exposure, which develops diseases in sensitive children (Almqvist et al., 1999). These types of allergens are seen in an inhabitant of a visibly clean area. Allergens are not just dust, it is mostly a mixture of organic and inorganic substances generated from other living beings. One of the most strongly allergenic components are house dust, often...
heavily contaminated with the fecal pellets and cast skins, is house dust mites. House dust mites are tiny creatures related to ticks, chiggers, and spiders who live in close association with humans. The primary food of house dust mites is dander (skin scales) shed from human and pet activity. Home dust mites may be the factor for 50 to 80 percent of asthma, and also in countless cases of eczema, hay fever, and other allergic related ailments.

Symptoms are usually respiratory (sneezing, itching, watery eyes, wheezing, etc). There are reports for a red rash around the neck. Other allergic reactions are headaches, fatigue, and depression. Inhalation of dust mites 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 that house dust mite is the most common allergy in people with asthma and it is an important “root cause” for the development of asthma in young children. These atopic diseases lead to increased burden of diseases and health care costs, particularly in patients with uncontrolled or poorly controlled diseases, and can also cause chronic infections. Asthma and allergic rhinitis can occur in the same person.

Allergy is also defined in the presence of immunoglobulin class Ig E which binds to the specific antigen. Allergic rhinitis is a nasal disorder induced by immunoglobulin E (Ig E)- mediated immune response and characterized by symptoms including rhinorrhea, sneezing, nasal obstruction, and itching. It is one of the most common atopic diseases all over the world. Asthma is more severe with allergic rhinitis people compared to those without allergic rhinitis. Immune responses are initiated by antigen-presenting cells such as dendritic cells, which present allergen to the T cells. Interleukin-1β, a potent proinflammatory cytokine, involved in many inflammatory conditions including autoinflammatory and allergic disorders. Detection of cat allergen in dust can be done by demonstrating antibodies and IL by ELISA method using monoclonal antibodies (Briner et al., 1993).

A recent study has found the precise mechanism for cat allergies which is the binding of the cysteine-rich portion through a mannose receptor (Emara et al., 2011). This study includes only dogs and cats because allergic responses to other animals are similar to allergic responses produced by dogs and cats allergens. The relationship of the pet has changed over time from outdoor protectors to indoor family members (Kennedy and McGarvey, 2008). Responding adversely to those agents depends on the genetic makeup of an individual, especially towards the environmental agents. Certain studies have found that new causes of the allergy can be epigenetic changes which means a heritable change in gene expression. Epigenetic change has 3 mechanisms: DNA methylation, histone modification, and non-coding RNA associated gene silencing (Lim et al., 2013). Epigenetic change is also linked to asthma (Breton et al., 2011).


**MATERIALS AND METHOD**

The study setting conducted was an online and offline survey, which is time-saving and different people can be covered. The number of participants involved in the study was 53 pet keeping owners. The sampling method used was search engines such as Pubmed, google scholar. A set of questionnaires including the parameters of having pets at home and in neighbor’s home, taking care of pets, the prevalence of allergy among the family, was included. The data was collected using google docs. The data manipulation was done in excel. The method
of representation of the results is a bar chart. The data were analyzed using SPSS software. The statistical test used is the Chi-square test.

RESULTS AND DISCUSSION

The results are categorized under 4 factors such as awareness, precipitating factors, comorbidity factors, and genetic factors. The responses were collected from 53 pet keeping owners.

In the study, 67.9% of the participants have pets at home (figure 1). 86.8% of participants have dogs than cats 13.2% (figure 2). 73.6% of the population is aware that pets can cause allergy (figure 3). When a question was asked regarding the relationship with pets, 47.2% of the participants chose their pets to stay indoor (figure 4).

Precipitating factors means the factor which is responsible for the onset of allergies. Question on “Do the participants allow their pets to sleep on the bed?”, 73.6% of the population don’t allow their pets to sleep on bed even though 26.42% allow their pets to sleep on their bed (figure 5). It is found that 50.9% used to sleep on the floor (figure 6). When the participants were asked about experiencing cough and sneeze in the morning, 43.4% of the participants have experienced coughing and sneezing in the morning even though 56.6% have not experienced it (figure 7).

Comorbidity factor means the co-occurrence of events for example after exposure to the pets some feel difficulty in breathing, continuous exposure might lead to asthma. In this study, 52.8% of the participant’s mother is more allergic than father 47.2% (figure 8). In some studies, there is a correlation between allergy and insulin resistance in this study, 32.08% of allergic people are diabetic though 67.92% are non-diabetic (figure 9). The study population with inherited traits for allergy, 18.87% have a family history of asthma (figure 10). Figure 11 represents the comparison between having pets at home and experiencing difficulty in breathing using the Pearson Chi-square. Figure 12 depicts the comparison between having pets at home and experiencing cough and sneezes in the morning using the Pearson chi-square test. Figure 13 depicts the comparison between having pets at home and episodes of respiratory disturbances using the Pearson Chi-square test. Figure 14 represents the comparison between pets at home and allergic responses in children using the Pearson Chi-square test. Figure 15 depicts the comparison between pets at home to the usage of drugs to control wheezing using the Pearson Chi-square test.

In this study, the hygiene of the pet owners was tested. The precipitating factors included are the relationship of the participants with pets, whether the participants allow their pets to sleep on their bed, whether the participants used to sleep on the floor. Pet allergens are found to be present on the floor or clothes which can lead to allergy. Sleeping on the floor results in contact with the dander and saliva of pets. A previous study shows the diagnostic approaches to pet allergies by checking the hygiene of the pet owners (Konradsen et al., 2015). Another study has reported that pet allergens can also be present on the surface of clothes and get transmitted (Enberg et al., 1993). The comorbidity factors included are whether the participants experienced coughing and sneezing, experienced difficulty in breathing, experienced respiratory disturbance. Previous studies report that breathing difficulty after exposure to pets can lead to asthma (Fernández et al., 2007). Another study reported that immunomodulatory protein alters the immune response after exposure to pets which leads to allergy (Herre et al., 2013). The current study shows that mothers are more allergic. Several studies have reported that genetic changes can also be one of the causes of allergies by three mechanisms of epigenetic change (Hollingsworth et al., 2008). In some studies, there is a correlation between allergy and insulin resistance, in this study, there is little evidence of diabetes. Another study has shown that asthma is linked to epigenetic changes (Selgrade et al., 2013). Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc, Marimuthu and Devadoss, 2018; Ramesh et al., 2018; Vijayashree Priyadharsini, Smline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree Priyadharsini, 2019; Chandrasekar et al., 2020; Mathew et al., 2020; R et al., 2020; Samuel, 2021)
Fig. 1: Pie chart depicting responses to the question regarding having pets at home. Blue represents yes and green represents no. 67.9% (blue) of the study participants have pets at home.

Fig. 2: The pie chart shows responses to the question regarding the type of pet at home either dogs or cats, where blue color denotes ‘dog’, green denotes ‘cat’, 86.8% of the population have dogs (blue) than cats 13.2% (green).

Fig. 3: The pie chart showing responses to the question if having pets at home can cause allergy, where blue color denotes ‘yes’, and green denotes ‘no’, 73.6% of the pet owners are aware that pets can cause allergies (Blue).
Fig. 4: Pie chart depicts the response to the question on the relationship of the participants with pets, where blue color denotes 'indoor', green denotes 'outdoor', 52.8% of the pet owners chose their pets to stay outdoors (green).

Fig. 5: Pie chart represents the response to the question on whether the participants allow their pets to sleep on the bed, where blue color denotes 'yes', green denotes 'no', 73.58% of the pet owners don't allow their pets to sleep on the bed (green) though 26.42% allow their pets to sleep on the bed (blue).

Fig. 6: Pie chart showing responses to the question regarding whether the participants sleep on the floor, where blue color denotes 'yes', green denotes 'no', 50.94% of the participants used to sleep on the floor (blue).
Fig. 7: The pie chart depicts the response to the question on study participants experiencing cough and sneezes in the morning, where blue color denotes ‘yes’, green denotes ‘no’, 43.4% of the participants have experienced coughing and sneezing in the morning (green).

Fig. 8: Pie chart showing the responses to the question regarding “among parents who are allergic?”, where blue color denotes ‘father’, green denotes ‘mother’, 52.83% (green) of the participants responded that mothers are allergic than father.

Fig. 9: Pie chart represents the response to the question of whether the allergic person is diabetic or not, where blue color denotes ‘diabetic’, green denotes ‘non-diabetic’, 67.92% of the people allergic is non-diabetic (green).
Fig. 10: The pie chart depicts the response to the question of family history of asthma, where blue color denotes 'yes', green denotes 'no', 18.87% participants have a family history of asthma (green) even though 81.13% have no records of family history of asthma (blue).

Fig. 11: The bar graph depicts the comparison between having pets at home and experiencing difficulty in breathing using the Pearson Chi-square where blue color denotes 'yes' and green denotes 'no'. The x-axis represents pets at participants' homes and the y-axis represents the number of participants who had difficulty breathing. The graph shows that 54.72% of participants who had pets at home did not experience difficulty in breathing. The Pearson chi-square value is \( p = 0.87 \) which is statistically not significant \((p>0.05)\). Susceptibility to pet allergy varies and genetically predisposed.
Fig. 12: The bar graph depicts the comparison between having pets at home and experiencing cough and sneezes in the morning using the Pearson chi-square test, where blue color denotes 'yes' and green denotes 'no'. The x-axis represents pets at participants' homes and the y-axis represents the number of participants who had coughs and sneezes in the morning. The graph shows that 30.19% of the participants who had pets at home experienced cough and sneeze in the morning. The Pearson chi-square value is p=0.82 which is statistically not significant (p>0.05).

Fig. 13: The bar graph depicts the comparison between having pets at home and episodes of respiratory disturbances using the Pearson Chi-square test, where blue color denotes 'weekly', green color denotes 'monthly' and red denotes 'perennial'. The x-axis represents pets at participants' homes and the y-axis denotes the number of participants who had episodes of respiratory disturbances. The graph shows 24.53% of the participants experiencing breathing difficulty weekly have pets at their homes. The Pearson chi-square value is (p)=0.06 which is statistically not significant (p>0.05).
Fig. 14: The bar graph depicts the comparison between pets at home and allergic responses in children using the Pearson Chi-square test, where blue color denotes ‘1 i.e boys’ and green denotes ‘2 i.e girls’. The x-axis represents pets at home and the y-axis represents the number of allergic children. The graph shows that 60.38% of boys with pets at home are more allergic. The Pearson chi-square value is (p)= 0.94 which is statistically not significant (p>0.05).

Fig. 15: The bar graph depicts the comparison between pets at home to the usage of drugs to control wheezing using the Pearson Chi-square test, where blue color denotes ‘yes’ and green denotes ‘no’. The x-axis represents pets at participant’s homes and the y-axis represents drugs to control wheezing. The graph shows that 26.42% of the population who are undergoing drugs to control wheezing have pets at their homes. The Pearson chi-square value is (p)= 0.04 which is statistically significant (p<0.05).
CONCLUSION
It is a general belief and opinion that cough and sneeze is the influence of the environment. The environment is everything around us, composed of gaseous and particulate matter generated from the materials around us. Animal danders are proven to be allergenic to many clinically proven allergic patients. The main aim of the study is to associate allergy and having pets at home. From the survey, it is obvious that the changing of the relationship of the pets from outdoor to indoor is the onset of the cause of allergy. Prevention can be done by avoiding exposure to pets allergen by keeping them clean when at home whether indoor or outdoor.

REFERENCES
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