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ENVIROMENTAL FACTORS INFLUENCE ON RESPIRATORY ALLERGIC DISEASES

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Abstract

Respiratory allergic diseases become increasingly widespread across the globe in the last 2 decades. A principal factor responsable for this major development is considered to be air polution. Allergies caused by pollens, are the most common models studied when considering the relationship between air pollution and respiratory alergic diseases.

A total number of 51 symptomatic patients were included in the study. Most popular pneumalergens which caused respiratory sensitization and allergy symptoms in Bihor county were mites and ragweed pollen. The urban population is the most affected regardless the suspected allergen, which shows us that the degree of urbanization has a high influence upon patients level of allergens sensitization.

Key words: pollen, sensitization, ragweed, mites, rhinitis, asthma

INTRODUCTION

Respiratory allergic diseases are know by most population and have become increasingly widespread across the globe in the last 2 decades (D'Amato et al., 2001).

A principal factor responsable for this major development is considered to be air polution. Studies have shown that urbanization and high vehicle carbon emissions and other pollutants, together with western lifestyle are all corellated with the increasing rate of respiratory diseases caused by pollens . This facts have been noticed especially in industrialized countries (D'Amato, 2011).

Climate changes led to pattern changes in air pollution by reshaping vegetation areas, increasing pollen concentration in numerous urban areas and by altering geographic distribution as well (Sinitchi, 2012), each of them with great impact upon respiratory health (D'Amato et al., 2013).

With the increasing population mobility all over Europe, espacially due to travel jobs phenomenon, better information related to new exposure risk to pollens seasonal allergy is necessary. Europe itself is a continent with a wide geographical diversity in terms of climat models and vegetation, therefore pollen calendar varies from one area to another. Nevertheless, most common causes of pollinosis seems to be pollens of grasses (D'Amato et al., 1998).

Allergies caused by pollens are the most common models studied when considering the relationship between air pollution and respiratory alergic diseases. There is evidence that air pollutants interact with environmental allergens, thus causing sensitization and modulate the allergenicity of environmental allergens.

Moreover, disturbing air mucosa and mucociliary clearance by air pollution, may facilitate the access of inhaled allergens to the immune system cells. A number of factors influence this interaction: pollutant type, plant species, nutrition balance, environmental factors, sensitization and hiperresponsivity degree for exposed persons (D'Amato et al., 2001).

Although genetic factors are important in the development of allergic diseases, their increasing presence among the population can only be explained by environmental changes. Atopy and asthma are more prevalent in developed and industrialized countries as opposed to developing countries, and the effect of migration is dependent on person's age and duration of exposure: early age and long exposure increase the likelihood of developing atopy and asthma (D'Amato et al., 2013).

The correlation between climate changes and distribution of allergenic pollen plants, can be proven by the:

- increased number of plants and their development as a result of climate change
- increased amount of pollen produced by each plant
- increased amount of allergenic proteins contained in pollen
- rapid growth of the plant throughout the season which leads to early production of pollen
- increased pollination period and pollen season, both at the same time (D'Amato et al., 2013)

Meteorological factors (temperature, wind speed, air humidity, storms etc.) along with climate regimes (warm or cold periods, dry and wet) can affect biological and chemical components of the interaction between pollen allergy and air polution (D'Amato et al., 2013). Storms that occur during the pollination season can induce severe asthma attacks in patients with pollinosis. Based on the present climate change scenario there will be an increase in the intensity and frequency of heavy rainfall episodes, including storms, in the next few decades, all of which will increase the number and severity of asthma. This tendency has already been noticed in emergency departments (D'Amato et al., 2013).

Household and environmental pollutants are represented by substances like monoxide and nitrogen dioxide, sulfur dioxide, ozone, dust and exhaust gases. Among the allergenic plants from our country the first is fodder grasses, followed by weeds but less by trees. The most important indoor sensitizers are generally mites. Their development is maximum at

temperatures of 25-30^{0}C, with high humidity conditions, respectively over 75% (Leru, 2006).

Studies suggest that respiratory allergies are manifested especially at pollen from trees, grasses and weeds. (Boehme et al., 2013) The most common cause of pollinosis in Europe is grasse pollen. In northern Europe the Betulaceae family pollen is the major cause of this disease. In contrast moderate winters and dry summers of the Mediterranean climate encourages the production of pollens that are found less frequently in central and northern Europe (eg. Genus Parietaria, Olea and Cupressus) (D'Amato et al., 1998).

Clinical and aerobiology studies show that the pollen map of Europe changes under the influence of cultural factors (eg. importation of plants for urban parks) and due to international travel (eg. expansion of weeds of the genus Ragweed in France, Northen Italy, Austria and Hungary). (D'Amato et al., 1998)

In a study conducted in 2004 in Zagreb, from a total of 750 patients screened for pollen prick, 365 were allergic to ragweed. Most patients had severe symptoms in August and September. The age group most affected was between 31-50 years old and those over 50 years old were less affected. 20,3% were ragweed pollen mono sensitized and 10,9% were ragweed (so called ragweed) and mugwort sensitized (Paternele t al., 2008).

A study of 1039 patients conducted in southwestern Germany and investigated by specific antibodies IgE, revealed that 374 patients had relevant senzitization to grasses, trees and weeds. On average 51,1% had hay fever, 65,2% had sneezing and 41,5% had sneezing when they made contact with herbs or flowers. The highest rate of sensitization was found to be for ragweed and mugwort (Boehme et al., 2013).

A study in Northern Italy over a period of 20 years aimed to analyze the development of sensitization to ragweed pollen and also clinical symptoms of those allergic patients in relation with the pollen concentration measured in the atmosphere. On average, 1,100 patients were included in this survey by using the prick test. As a result, ragweed sensitization rate increased from 45% to 70% for patients found positive through skin prick test. In respect of symptoms, during 5-years span, the percentage of those with respiratory symptoms (rhinitis and/ or asthma) increased from 45% to 70% so that at the end of the 20 years of study it reached to 90%. Prevalence of asthma patients sensitized to ragweed pollen increased from 30% to 40%. (Tosi et al., 2011)

A study in Timisoara in the period 2009-2011 showes an increase in the rate of sensitization of patients to pneumalergene from 45,5% to 50,39%. Among those included in 2011, 31,42% were sensitized to outdoor pneumalergene, 22,95% to indoor and the rest polysensitized. Ragweed

pollen was the most important outdoor pneumalergen in Banat region. The highest level of ragweed pollen in the atmosphere was measured in August and the service addressability for allergy was increased about 2 weeks after pollen concentration started to grow up. Predominant symptoms included rhinoconjunctivitis and asthma and rarely cutaneous manifestation. (Panaitescu et al., 2013)

Pollen allergy prevalence is estimated at over 40% in general population. The most commun allergic disease is seasonal rhinitis. Another study conducted in Cluj Napoca among 74 symptomatic patients with skin prick test to environmental allergens, revealed that 27% of them were monosensitized to ragweed pollen and 73% had polysensitization. Among those with polysensitization, 48,15% prick test indicated positive results for mugwort pollen. Those with monosensitization had predominantly moderate-severe rhinitis compared to the rest. Asthma was more frequently associated among those pacients with polysensitization. (Bocsan et al., 2011)

MATERIAL AND METHOD

The objective of the study was to assess the impact of environmental factors on patients in Bihor county diagnosed with respiratory allergies.

The study was conducted in a private practice office for allergy medical treatment and included a total of 51 patients from Bihor county, all of them selected upon respiratory allergies standard screening battery of allergens. The study included pacients in the period from september 2012 to august 2014. The patients were assessed by prick skin tests to 13 pneumoallergens most frequently sensitizers (trees, dust mites, grass, lawn grass, weeds, cat dander, molds and so forth).The results are shown in Fig 1. All tested patients showed allergy symptoms, being new cases detected with one or more diagnoses of respiratory allergy such as rhinitis, asthma and conjunctivitis, but the majority with rhinitis.

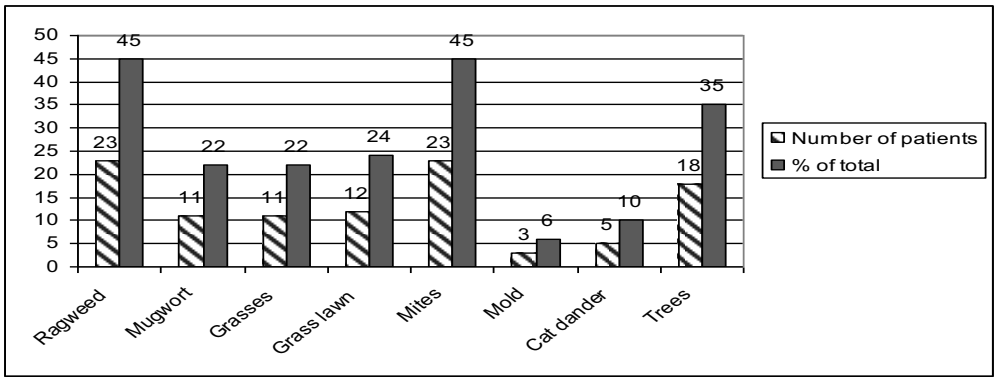

Fig.1 Sensitivity to allergens distribution for sample's patients

Patients were between the ages of 2 and 52 years, coming from both rural and urban areas. Throughout the study the following parameters were followed and analyzed: gender distribution, age groups, urban/rural area of daily living, degree of sensitization between one or more allergens, symptoms from moderate-severe to mild illnesses, responsible allergen detected for respiratory disease and the month of first medical consultation with allergologist.

RESULTS AND DISCUSSION

Of the total number of 51 patients included in the study, tested and diagnosed with one or more forms of respiratory allergies, 36 (71%) were from urban areas and 15 (29%) are living in rural conditions. In respect of gender distribution, 22(43%) were men and 29 (57%) were women. The number of patients diagnosed as sensitized to ragweed was 23(45%). Their percentage increases from 46% in 2012 to 54% in 2014 reaching the European averages (in accordance with numbers from different sources). When analyzing urban vs rural living we found that 16 patients were from urban areas and 7 from rural, a balance quite close to whole group structure entered into the study. This significant gap indicates in my opinion that the greatest concentration of ragweed pollen is around and inside urban agglomeration which is by far with most environment pollutants. From the 23 patients sensitized to ragweed we found that in 70% of cases (16 patients), ragweed was the main trigger of respiratory symptoms.

Also, the number of patients found to be sesitized to mites were 23 and their percentage increased from 46% in 2012 to 69% in 2014. In contrast to the group with sensitivity to ragweed, those with mite had a more balanced distribution, respectively 13 from urban areas and 10 from rural. One possible interpretation would be that in the case of mites, indoors conditions are more or less similar for both living conditions(urban and rural). From those sensitized to mites, 20 patients (87%) had this allergen as main factor responsible for triggering the symptoms.

Based on these facts, we can conclude that both ragweed and dust mites are found to be the main triggers of respiratory symptoms.

The number of patients with sensitivity to trees allergens decreased slighty from 38% in 2012 to 31% in 2014, the difference between rural versus urban living conditions not being significant (8 vs. 10). For this reason we can draw the same conclusion as from mites in terms of rural vs. urban provenance. From those found sensitized to trees, none of them had initial symptoms triggered by trees.

In respect to other pneumalergenes sensitization (less then ragweed, mites and trees), 11(22%) patients were allergic to gramineous plants, 11 (22%) to mugwort, 12 (24%) to lawn grass, 3 (6%) to molds (cladosporum and penicilium) and finally 4 (8%) were allergic to cat dander. As far as symptoms triggers are concerned, for 25% lawn grass was responsable, for 45% , mugwort and for 55% we noticed gramineous plants as being responsable.

Average distribution shown us the same surplus in urban areas, the ratio being 8 to 4, 10 to 1 and 6 to 5 (we refered here to patients allergic to lawn grass, artemisa and gramineous plants).

Another interesting aspect is the evolution of the number of patients per age group. Thus the 0-10 year olds group finds a semnificative difference between those with sensitivity to mites that those to ragweed, taking into consideration that from the same number identified as sensitive to each allergen the percentages are quite different, respectively 39% to mites versus 17% to ragweed. As far as 10-18 years group is concerned, the number of patients are increasing with age with the same slope for those with sensitivity to mites and those to ragweed. After 18 years of age, the increasing rate of number of patients with sensitivity to ragweed quite excceded the same indicator specific to mites (see Fig.2).

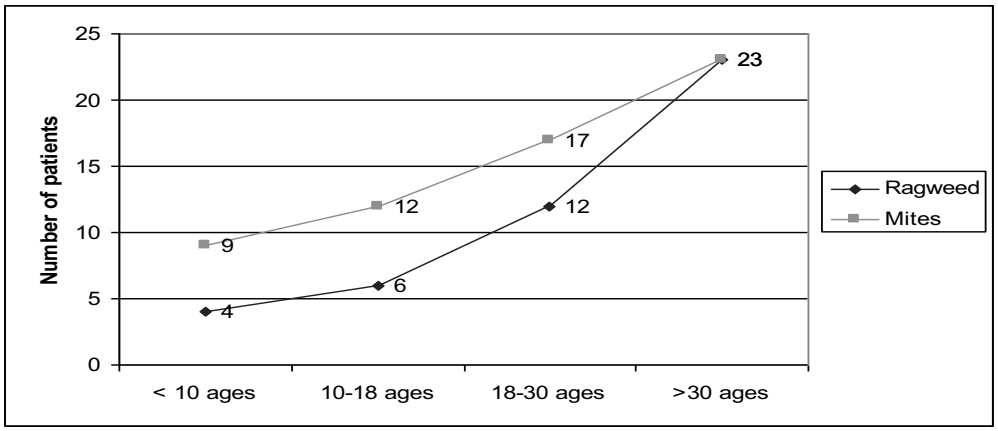

Fig 2. No. Of patients within age groups with sensitivity to ragweed and mites allergens

One possible explanation for this different trends is that ragween sensitization occurs later in life because of outdoor activities extention while the mites present favorable conditions inside cabin, thus leading to an increased risk of early awarness (in some cases close to birth time). In support of this conclusion we can take into consideration the confidence interval for 95% accounted for each average, which shows us the following data: 22,3 to 35,7 years old for those with sensitivity to ragweed and 13,2 to 25,8 for those to mites.

Another potential conclusion (the sample was not representativ for entire region population) is that ragweed pollen gave by far the most cases of moderat-severe symptoms (45%) as oppose to mites with 17% which is the next value in a row for this indicator, among others allergens in the study.

While the addressability of patients with sensibility to mites was relatively constant throughout each period of year, for ragweed or regween most patients were presented to consultation in August and September, where we can assume there was the highest concentration of pollen in the atmosphere.

CONCLUSIONS

1. Most popular pneumalergens which caused respiratory sensitization and allergy symptoms in Bihor county were mites and ragweed pollen.
2. It was noticed that the urban population is the most affected regardless the suspected allergen, which shows us that the degree of urbanization has a high influence upon patients level of allergens sensitization.
3. Early and long-term exposure to house dust mites leads to higher patients sensitivity level.
4. Mites allergens generally produce mild symptoms of rhinitis and also permanent, which is opposite to ragweed which produces seasonal but severe forms.
5. Patients with ragweed pollen have the highest addressability during full pollination season with a maximum impact on respiratory symptoms.
6. As other studies have revealed for west part of the country, ragweed pollen is the most important external pneumalergen for Bihor county area.

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