INFLUENCE OF THE AIR POLLUTION WITH POLLEN ON THE HEALTH OF THE POPULATION IN NW PART OF ROMANIA

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Abstract

Pollen, allergens derived from a plant, is a natural component of the atmosphere and its abundance is influenced by the human activity, the environmental conditions and the geographical environment. In Romania's spontaneous flora there is a large number of potentially allergenic plants, including both herbaceous and woody species. Among them some have become allergenic only in recent years, while others give more severe reactions. The changes of the climate and air pollution causes modifications in both quality and quantity of air pollution on pollen. In Romania, a large number of people suffer from allergic diseases. Pollen allergy prevalence is high, about 50%, and its incidence is growing. This study examines the prevalence of allergies in the north-west of Romania, during a year, depending on the timing of the main pollen allergens species in this part of the country.

Key words: pollen, allergies type, pollution, prevalence of allergies, allergenic species

INTRODUCTION

In Europe, about 40% of people who suffer from respiratory allergies present pollen allergy (D'Amato et al., 2007).

In Romania, more than three million people suffer from allergic diseases. Pollen allergy prevalence is high, about 50%, and its incidence is continuously growing (Pallag et al., 2011; Dinescu et al., 2005).

Airborne allergens coming from plants can be pollen, spores, seeds, leaf and stems debris or protein molecules. These allergens are a natural component of the atmosphere. Pollen of gymnosperms and angiosperms plants can be transported great distances from the place of production. Allergens abundance is influenced by human activity, correlated with ecological and geographical conditions of the urban environment and the level of stability achieved. The presence of neglected areas favors opportunistic species (Ianovici et al., 2013; Bullock et al., 2010).

The aerobiological and allergies studies show that the pollen map of the European continent is continuously changing, as a result of different factors: the import of plants such as birch and cypress for urban parklands, greater international travel and climate change. In this regard, the higher

frequency of weather extremes, like thunderstorms, and increasing episodes of long range transport of allergenic pollen represent new challenges for researchers (D'amato et al., 2007; Estrella et al., 2006; Fraile et al., 2006).

Besides these changes at the European level, since 1990 in Romania many agricultural lands were abandoned, massive deforestations occurred, so that it increased the surface of land where the species with potential allergenic pollen spreaded strongly (Hodişan & Morar, 2007).

It is known that many species of plant are allergenic, some of them became allergenic only in the recent years, and others give much stronger allergenic reactions lately (Pallag et al.; 2011, Bauchau & Durham, 2004; Stevens et al., 2003).

There are studies confirming that the climate changes and the pollution conditions can produce structural and chemical transformations of composition in the coating of pollen grain, which causes stronger irritation of the mucous membranes of the respiratory tract (Stevens et al., 2003; Pallag et al., 2011; Juhász et al., 2002).

The number of allergenic species in the wild flora of Romania is high, and includes both species of ligneous plants and herbaceous species. The most important in terms of release of the airborne pollen allergen are: *Salix sp., Fraxinus sp., Betula sp., Carpinus sp., Platanus sp., Sambucus nigra, Tilia sp*., of ligneous species, respectively *Plantago sp., Taraxacum officinale, Urtica sp., Ambrosia artemisifolia* şi mai mulţi reprezentanţi din *Familia Poaceae,* of the herbaceous species.

Among ligneous plants Betula sp., the birch, creates the biggest problems, in recent years the number of patients sensitive to pollen of these species tripled (Bauchau & Durham, 2004).

Among herbaceous species, the most allergenic is *Ambrosia artemisifolia*, which has the current status of invasive species, accidentally introduced with incompletely known spreading, but with presence signaled in all regions of the country (Taus et al., 2010). Due to the allergenic pollen produced in large quantity during flowering period, which is very long (between the months VI-IX), ambrosia is considered one of the most allergenic plants, responsible for the most allergic diseases during the blooming period (Ianovici et al., 2013; Taus et al., 2010; Popa et al., Karanikol et al., 2008).

Due to the long and late flowering of ambrosia, the pollen produced by this plant represents a threat to the health of persons allergic to pollen of herbaceous or ligneous species, determining a potential extension of allergic manifestations, almost all year (Gram & Sork, 2001).

This study examines the prevalence of allergies in the north-west area of Romania, during one year, depending on the pollen calendar of the main allergenic species in this part of the country.

MATERIAL AND METHOD

To evaluate the effect of pollen on the health of the population, there were monitored the allergy cases presented in the ambulatory of the Emergency County Hospital Oradea, during the year 2014. A total number of 5763 cases were registered, with medium and severe forms of allergies, mild forms being treated in general by family doctors. The pollen calendar of the main allergenic species in the north-west area of Romania was drawn up and it was determined the prevalence of the number and type of allergies, according to this calendar.

RESULTS AND DISSCUSIONS

The pollen calendar is presented in Table 1.

Table 1

The pollen calendar of the allergenic plants in the north west of Romania

Species	Month (2014)							
	III	IV	V	VI	VII	VIII	IX	X
Willow (Salix)								
Birch (Betula)								
Hornbeam (Carpinus)								
Ash (Fraxinus)								
Plane (Platanus)								
Elder (Sambucus)								
Linden (Tilia)								
The barley of the mice (Hordeum)								
Nettle (Urtica)								
Dandelion (Taraxacum)								
The steppe flower (Ambrosia)								

53.6% of patients were women and 46.25% men, the mean of age was 45.99 years, and in terms of backgrounds, most were from urban areas (table. 2).

Table 2

Characteristics of the group

Characteristics	Values
Sex (Female/Male)	53.6%/46.24%
Average age	45.99±8.58 years old
Environment (Urban/Rural)	60.68%/39.32%

According to the pollen calendar of the main allergenic species from the northwest area of Romania, during one year, there are only four months in which these plants are not flowering. The blooming period ends in the Xth month, but pollen allergenic particles can still be found for a period in the atmosphere.

During the four months the number of cases of allergies is relatively constant, but we noticed a significant increase in spring and summer months, with a prolongation until the month November (tab. 3)

Table 3

The distribution by months

Month	Nr. of cases	%
January	299	5.19
February	359	6.23
March	451	7.83
April	669	11.61
May	688	11.94
June	576	9.99
July	663	11.50
August	485	8.42
September	442	7.67
October	430	7.46
November	401	6.96
December	300	5.21

Most allergies were recorded from April to July with a monthly average of 1.8 times higher than during the period January-March and 1.6 times higher than in the period from August to December.

The most common allergic reactions to the pollen are asthma and allergic rhinitis, but the pollen is not only responsible for inducing respiratory allergic reactions but also for exacerbating atopic dermatitis.

In the current study most of the cases were of asthma (64.83%), followed by rhinitis (23.49%) and dermatitis represented 11.68%. (tab. 4)

Table 4

The distribution by allergy type

Diagnosis	Nr. of cases	%
Allergic Asthma	3.736	64.83
Allergic Dermatitis	673	11.68
Allergic Rhinitis	1.354	23.49

It is noticed that the increased frequency of the determined types of allergies coincides with the flowering of the main allergenic species from Oradea area, with a maximum prevalence in the first months of flowering from April to May (table 5).

Table 5

The distribution of allergy type by months

Month	Allergic Asthma		Allergic Dermatitis		Allergic Rhinitis	
	Nr. of cases	%	Nr. of cases	%	Nr. of cases	%
January	212	5.67	39	5.79	48	3.55
February	238	6.37	30	4.46	91	6.72
March	295	7.90	60	8.92	96	7.09
April	413	11.05	93	13.82	163	12.04
May	478	12.79	59	8.77	151	11.15
June	341	9.13	77	11.44	158	11.67
July	396	10.60	99	14.71	168	12.41
August	336	8.99	43	6.39	106	7.83
September	290	7.76	60	8.92	92	6.79
October	279	7.47	44	6.54	107	7.90
November	265	7.09	37	5.50	99	7.31
December	193	5.17	32	4.75	75	5.54

Of the 5763 cases reported in ambulatory, 167 cases were hospitalized, representing 2.90%. It was also observed that the number of hospitalized cases is much higher in months when the amount of pollen in the air is higher (fig. 1).

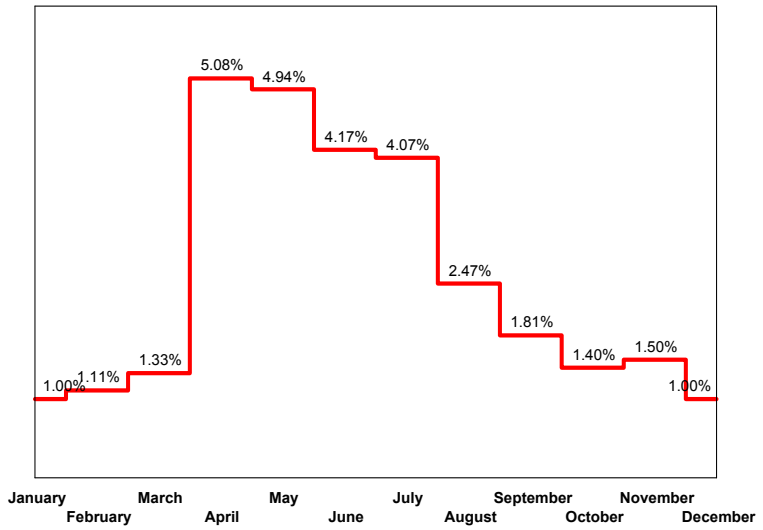

Fig. 1 The distibution by months of hospitalized cases

The results of the epidemiological studies have shown an increased incidence of respiratory allergies caused by the pollen among peoples living in urban comparing to rural areas, this correlates with traffic congestion respectively with high emissions produced by vehicles and the westernization of the lifestyle (Gram & Sork, 1999; Boehme et al., 2009). It was also demonstrated that at high concentrations of CO_2, plants produce more pollen (Ianovici, 2009, ROGERS et al., 2006).

Knowing the presence, distribution and blooming period of spontaneous and cultivated plants with allergenic potential, and monitoring the pollen from the air in a certain area are needed for an etiologic diagnosis of the respiratory allergies. Changes of the allergenic content in the air should be known to react early enough, with changes in the diagnosis and treatment, whenever a new allergen appears [Ianovici et al., 2013, D'Amato & Cecchi, 2008, D'Amato et al., 2011).

Monitoring the amount of pollen in the air, in critical periods, becomes an important objective. Warning the people in good time about increasing the amount of pollen would be particularly useful in the prevention of allergic crisis at sensitive persons, given the extremely high number of cases, both nationally and in the new studied zone, and demonstrated clinical effectiveness of specific immunotherapy (Déchamp, 2013).

Along with the implementation of prophylactic measures and the controlled decontamination of the areas with allergenic species, new sensitizations can be avoided, allergic manifestations are reduced at already sensitized individuals, and also the cost of the anti-allergic treatment are decreased.

CONCLUSIONS

The present study determined that a significant increase of the number of allergies occures in the blooming period of the main allergenic species from the north-west of Romania, with a maximum prevalence in the months April and May, with a monthly average of 1.8 times higher than in the period January to March and 1.6 times higher than in the period from August to December.

2.90% of the patients had severe manifestations, requiring hospitalization.

The large amount of the pollen in the air during this period, associated with the presence of other pollutants have determined an increasing of the frequency and severity of rhinitis and allergic asthma and an impairment of the dermatitis clinical expression, especially in urban areas.

Reducing air pollution could help reduce the amount of pollen and thus reduce the frequency and intensity of allergic symptoms for sensitive patients.

Legislation in Romania for care farmland, of eliminating the invasive plants with allergen potential like ragweed is still insufficient or unclear to ensure the protection of people allergic to pollen. Moreover, the laws that already exist are not enforced strictly. These causes lead to a massive invasion of such allergens plants and thus also to a large and increased number of patients, from year to year, determining the potential extension of alergic manifestations, almost during the entire year.

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