OLIVE POLLEN ALLERGY AND THE RISK OF DISEASES DEVELOPMENT

Immunology

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ABSTRACT

Olive pollens are one of the main factors causes of allergies affecting the population in industrialized countries.
We studied prevalence of olive pollen allergy and the relationship between olive pollen allergy and the existence or development of other diseases in Beni Mellal (BM) city. We conducted a cross-sectional study using a questionnaire among subjects allergy in a sample size of 400 subjects, chosen randomly from BM.
Our epidemiologic studies revealed a crucial role of olive pollen in increasing of prevalence of allergic disorders. Furthermore our results show dependence between asthma and cardiovascular diseases in people allergic to olive pollen suggesting that asthmatic people who are allergic to olive pollen are the most susceptible to develop cardiovascular disease. These findings should be explored by clinical research in the future that can help in understanding the mechanisms associated with the asthma and cardiovascular disease in people allergic to olive pollen.

KEYWORDS

Olive pollen; Allergy; Asthma; Cardiovascular disease; Beni Mellal and Morocco.

INTRODUCTION

Currently the relationship between the environment and health is important where the announced disasters and pandemics continue to multiply. The World Health Organization (WHO) estimates that up to 24% of current diseases worldwide can be attributed to environmental degradation '(Maamri, 2017). Global climate change is now measurably affecting many critical physical and biological systems for human health. The effects of climate change on health cause an increase in the prevalence of allergic respiratory diseases, asthma and exacerbations chronic obstructive pulmonary disease and premature mortality (Emberlin, s.d.), (Reid & Gamble, 2009), (Alaoui & Barje, 2017). The change in environment (pollution, lifestyles) and climate has been shown to play an important role in the increased prevalence of allergic diseases '(Gennaro DAmato et al., 2016).

In recent years, allergic diseases have increased in economically developed countries. They rank fourth in terms of the frequency of diseases listed in the WHO. These conditions have become a real public health issue because they affect all ages and affect all organs simultaneously and successively. According to WHO, by 2050, fifty percent of the world's population will be affected by at least one allergic disease.

Pollen allergy, or pollinosis, is a condition linked to the presence, in the course of the seasons, of a greater or lesser quantity of pollen grains from very different plants. Notably because of the impacts of climate change on plant allergic species (Shahali, Poncet, & Sénéchal, 2013)(Sénéchal et al., 2015).

The environment associated with climate change plays an important role in length of exposure, pollination intensity, pollen dispersal and distribution of tree and plant species (rise in latitude) contribute to the increase cases of allergy observed in recent years '(Gennaro DAmato et al., 2016).

However, once the pollens are suspended in the air, the man functions as a kind of vacuum cleaner with each inspiration and can be subject to allergies(Shahali et al., 2013). In fact, pollinosis can cause allergic people, symptoms such as rhinitis, conjunctivitis, but also respiratory complications of varying severity (irritative cough, tracheitis, asthma, etc.) and more rarely cutaneous manifestations (urticaria, eczema) (Brito et al., 2011)(Bousquet et al., 2008).

Olive trees are the most common sources of allergenic pollen worldwide. The origin of this long-life tree seems to be Asia Minor, where the birthplace of the cultivated olive tree took place six millennia ago. From there it spread to Europe and North Africa, and in the sixteenth century to the American Continent, Mexico, California, Peru, Chile and Argentina. More recently the olive tree has continued to expand and today is farmed in South Africa, Australia, Japan and China(Bousquet, Cour, Guerin, & Michel, 1984).

Oleaceae family, only the olive pollen is considered an important aeroallergen but other species of the family could be an important source of airborne pollen allergens. Sensitization to olive (Olea europaea) pollen is also an important cause of pollinosis in Mediterranean countries '(G. DAmato et al., 2007)(Berghi, 2014). The main pollen season is from April to June '(G. DAmato et al., 2007). Currently, 13 allergens have been described in *O. europaea;* 12 from pollen and one (thaumatin) as a food allergen from the olive fruit '(Gennaro DAmato et al., 2016). Ole e 1 is the major allergen, being considered the most common sensitizing allergen, recognized by more than 70% of olive sensitized patients '(Gennaro DAmato et al., 2016) and it has been proposed as a diagnostic marker for primary sensitization to *Oleaceae*.

Seasonal exposure to olive pollen (Olea europaea) is increasingly recognized as an important cause of allergic rhinitis (AR), respiratory allergic disease particularly in the Mediterranean region and the Middle East'(G. DAmato et al., 2007). Olea europaea pollinosis is clinically characterized by rhinoconjunctival symptomatology than bronchial asthma(Brito et al., 2011). Although data are limited, it has been reported that olive-induced allergy is associated with more severe symptomology in comparison with other nongrass allergies and that quality of life (QoL) is lower in patient with olive-associated AR (and olive-associated asthma) than in patients with diseases caused by other common allergens(Devillier et al., 2016).

The olive tree is the main fruit speculation in Morocco with an area of about 680 000 ha, nearly 55% of the national arboriculture orchard. Its importance is justified by the the quality and beneficial effects of its products on the health of Mediterranean populations for centuries.

In Morocco, allergic diseases are becoming more frequent. Recent studies established by our team show the impact of the city

environment on human health: the case of pollen allergy in region of Beni Mellal. The percentage of pollen-allergic students surveyed at the Beni Mellal Polydisciplinary School was 39% (Alaoui & Barje, 2017). This study shows that the olive tree is the main allergen causing pollen allergy in the region. This study shows that most students have allergies in the spring season; this could be explained by the pollinisation of olive tree in this period. These results prompted us to study the relationship between olive pollen allergy and the existence or development of other diseases in Beni Mellal city.

MATERIALS AND METHODS
Study area
The region of Beni Mellal-khénifra (BM-KH) is one of the twelve Moroccan regions created by the territorial division 2015; it includes the region of Tadla-Azilal and the provinces of khénifra and Khouribga, located in the center of the country. It encompasses the plain of Tadla, between the high atlas and the middle atlas its is in center. The region is characterized by a very continental climate and the precipitation slope varies between 300 and 750 mm depending on the year. Agriculture represents the dominant activity at the level of the region. We chose Beni Mellal city, as a place for the study of olive pollen allergy; that is characterized by its rich vegetation.

Study Participants
The project consists to study prevalence of pollen allergy in a sample size of 400 subjects, chosen randomly from Beni Mellal (BM) city. A questionnaire (see annex) was prepared for this study.

These subjects were asked to study the prevalence of olive allergy. Several categories of questions were used in our questionnaire: personal data (sex, age and habitat), dichotomous question (the existence of olive allergy), multiple choice questions to know olive allergic symptoms (ocular, nasal and asthmatic symptoms), onset of symptoms (summer, spring, fall and winter) and the study of the existence of another disease.

Statistical Analysis
Confidence interval: The study of proportion of olive pollen allergy in the BM is important feature in our study but its exact value cannot be given since it is impossible to have comprehensive information about the population. We estimate its exact value by the confidence interval with an error risk of 5%.

The method: At the risk of error 5%, the unknown proportion of a population, which can be deduced from a random sample, is within the confidence interval of the form:

With:
p = proportion of the sample, α = risk of error equal to 5%, n = sample size

$Z_{(1-(\alpha)/2)}$ = A normal centered reduced variable for the case of n > 30 Statistical analysis of the data was performed using excel and handled by the software of statistical processing (SPSS), version 22. Variables were considered statistically significant at p values of less than 0.05.

The information about the number of people affected by olive pollen allergy in the BM was statistically evaluated
by measuring the prevalence P. P = p * 100

Chi-Square Test of Independence
it allows to test independence of two or more criteria of classifications, it is a test of stochastic independence. The method: independence test between rows and columns Khi²: Given a table of measurements of p rows and q columns, the variable Khi² (observed value) is calculated from the sample and compared with the value Khi² (critical value) obtained in the Pearson Khi² table at a number of degrees. of freedom obtained by (p-1) (q-1) and at the risk of error fixed before to 5%, if Khi² (observed value) is greater than Chi² (critical value) one rejects the hypothesis of independence of the criteria , at the risk of being 5% wrong. Chi-Square test of independence is used to determine if there is a significant relationship between gender (male vs. female), diseases and allergy.

RESULTS
Prevalence of people allergic to olive pollen surveyed in the BM
Our survey conducted in the BM shows that the percentage of people allergic to olive pollen is 30.25% while the percentage of non-allergic is 69.75%, which means that the number of people allergic to olive pollen is important in this region.

• Estimation of the proportion of olive allergy sufferers in the BM: In this way we have calculated the confidence interval in order to see if our sample is representative of all the population allergic to olive pollen.

At the risk of error 5%, the unknown proportion of a population, which can be deduced from a random and simple sample, is within the confidence interval of the Form:

$$\left[\mathbf{p} - \mathbf{Z}_{1-\frac{\alpha}{2}} \times \sqrt{\frac{\mathbf{p(1-p)}}{\mathbf{n}}}, \ \mathbf{p} + \mathbf{Z}_{1-\frac{\alpha}{2}} \times \sqrt{\frac{\mathbf{p(1-p)}}{\mathbf{n}}} \right]$$

P	α	n	$Z_{1-\frac{\alpha}{2}}$
The proportion of the sample	The risk of error equal to 5%	The size of the sample	A standard normal variable for the case of n> 30

From the law table N (0,1): $Z_{(1-\alpha/2)} \cong 2$

The proportion of people olive allergic in the sample taken at random in the city of Béni-Mellal, number n = 400, is:
$P \cong 0.3$

That is to say, in our sample we have almost 30% of the subjects who show an allergy to olive pollen according to the table of the following observed data:

Sex	Female	Male
Number of olive allergic subjects	73	48

As follows, the 5% confidence interval around the proportion of subjects allergic to olive pollen in the BM is given by interval [0.26; 0.33]. In all of the people surveyed, between 26% and 33% of people who have an allergy to olive pollen. Thus, 30% of pollen allergic subject's fall within the confidence interval [0.26; 0.33] calculated. These results show that our sample is representative of the population studied.

Distribution of people allergic to olive pollen surveyed according to the habitat environment and to the period of onset of allergy in the BM

The analysis of the results of our survey on people with allergies shows that the percentage of people from rural areas is 42.98% and 57.02% for urban people. The habitat environment therefore plays a role in the progression of olive pollen allergy.

Figure (1) shows the distribution of people allergic to pollen allergy according to the period of onset of allergy, we find that 40.5% are allergic since adolescence, 30.58% are allergic since adulthood and 28.92% who have allergy to olive pollen since childhood.
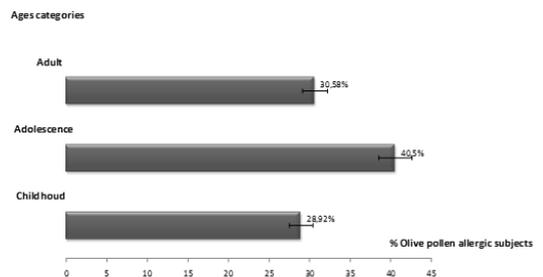

Figure 1. Distribution of people allergic to olive pollen according to the period of onset of allergy

• *Estimation of the existence of a relationship between age categories and the appearance of allergy:*

From Figure (1) we notice that there is a difference between the number of people allergic since childhood, and those who are allergic to adolescence and adult allergic subjects.

We tested whether if there is a dependency and relationship between age categories and the appearance of allergy.

Observed and theoretical numbers are grouped together in the following table:

	Allergic to olive pollen	Non allergic to olive pollen	Total
Childhood	9 6.95	14 16.04	23
Adolescence	48 65.03	167 149.96	215
Adult	64 49.00	98 112.99	162
Total	121	279	400

According to the table we find that:
Khi² (observed value) 13.8
Khi² (critical value) 5.99
DDL (3-1) (2-1)

According to the results obtained, we find that the observed value is greater than the critical value so we reject the hypothesis of independence.

Conclusion: At the risk of 5% of this misleading, we can say that there is a relationship between age classes and the existence of allergy.

Distribution of symptoms due to allergic to olive pollen olive pollen allergic subjects in the BM

Our results showed shows that spring is the only season in which allergy to olive pollen increases (100%) compared to other seasons. The pollination season of the olive tree is spring, which explains the increase in the number of people with allergies in this season.

The most common symptoms of olive pollen allergy among people in the BM region are: sneezing (26%), difficulty breathing (28.8%) and redness of the eyes (28.12%). Since the percentages of the symptoms are almost the same, we deduce that they are linked, one causes the other.

Diseases related to the presence of olive pollen allergy in the BM

Our results showed a link between the symptoms of allergy to olive pollen, which shows a dominance of respiratory diseases following the inspiration of olive pollen. At the forefront are allergic rhinitis (62%) followed by conjunctivitis (44.63%), asthma (32.23%) and urticaria (27.3%), which in turn causes inflammation of the eyes and skin due to contact with olive pollen.

Our field survey also shows that there are other diseases associated with olive pollen allergy among people in the region: cardiovascular diseases (16.53%), some autoimmune diseases such as diabetes (13.22%) and lupus (16.53%) and stress-related diseases (9.91%) (Figure 2).
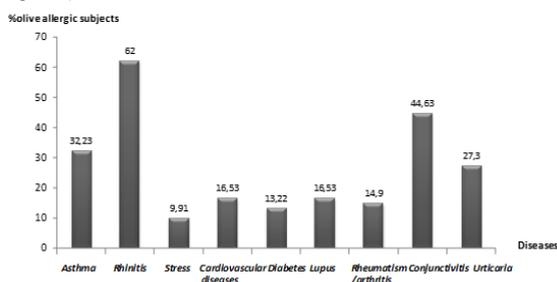

Figure 2. Distribution of major diseases due to PO allergy in the BM

• Estimate of the existence of a relationship between asthma and cardiovascular diseases:

According to the results of our investigation, we find that there are diseases among the inhabitants of this region that may be due to the allergy to olive pollen. The independence test was applied to establish a link between asthma and cardiovascular disease in olive pollen allergic subjects.

We group together the observed and theoretical numbers in the following table

		Asthma		
		Yes	No	Total
Cardiovascular disease	Yes	12 7.15	8 12.84	20
	No	27 31.84	74 68.44	101
	Total	39	82	121

According to the table we find that:
Khi² (observed value) 8.49
Khi² (critical value) 3.4
DDL (2-1) (2-1)

CONCLUSION:
At the risk of 5% of this misleading, we can say that there is a relationship between cardiovascular disease and asthma in people allergic to olive pollen.

DISCUSSION
In our study we found that (30.25%) of the people surveyed are allergic, this percentage falls well within the confidence interval [26%, 33%] estimated, at the risk of error 5% of the rate of allergic subjects in the BM, which proves that our sample is representative.

The distribution of allergic people according to the habitat indicates that there is a difference, the present urban environment (57.02%), while the rural environment is just (42.98%). It can be suggested that air pollution, especially diesel particulates, can aggravate the allergy; they act either directly on the respiratory tract or indirectly on the pollen grains by modifying their allergenicity.

According to our survey, we find that the period of onset of allergy is related to the age categories has different percentages; adolescents are the most affected (40.5%) because of the exchange of habitat environment for studies or other work, as well as this age group are distinguished by frequent activity.

Our results show using the independence test the existence of a relationship between the appearance of olive pollen allergy and the age categories. We also found that allergy to olive pollen only existed in the spring, these results being explained by the pollination of the olive tree at that time. The most common clinical symptoms of pollen allergies in the olive tree are various, the manifestations are proportional (nasal symptoms, ocular symptoms, asthmatic symptoms).

The analysis of the results of the questionnaire shows that people allergic to olive pollen may be susceptible to other diseases such as respiratory diseases mainly asthma and autoimmune diseases such as lupus and cardiovascular diseases. At the risk of error of 5%, our results show dependence between asthma and cardiovascular diseases in people allergic to olive pollen suggesting that asthmatic people who are allergic to olive pollen are the most susceptible to developing cardiovascular disease. These findings should be explored by clinical research in the future that can help in understanding the mechanisms associated with the asthma.

CONCLUSIONS AND PERSPECTIVES
Several studies have identified links between substances or situations in our environment and certain diseases. Our epidemiologic studies revealed a crucial role of olive pollen in increasing of prevalence of allergic disorders. This study, propose the link of olive pollen in the development of allergy in the BM. Furthermore our results show dependence between asthma and cardiovascular diseases in people allergic to olive pollen suggesting that asthmatic people who are allergic to olive pollen are the most susceptible to developing cardiovascular disease. These findings should be explored by clinical research in the future that can help in understanding the mechanisms associated with the asthma and cardiovascular disease in people allergic to olive pollen.

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