Asthma and allergic rhinitis (AR) represent a major health problem, as both diseases are relatively common and cause significant symptoms that interfere with the lives of those affected [1,2]. In Portugal, asthma affects approximately 7% of the population [1], while AR affects up to 26% [2]. Aeroallergens are common asthma and AR triggers [3] and are usually classified as indoor, outdoor (pollens and molds), or occupational [4]. Previous studies have confirmed the association between pollen levels and asthma-related emergency department visits [5], but no data are available on other resources used by patients. Google Trends (GT) is a web-based search tool that indicates trends related to specific Google queries over a defined period of time [6]. Its utility in allergic disease monitoring has been evaluated only in terms of the relationship between total pollen counts and rhinitis and only in relation to searches in English and German [7,8]. No studies to our knowledge have analyzed GT search trends for asthma, other languages, or individual pollens. The aim of this study was to explore the correlation between pollen counts and GT searches for asthma, rhinitis, and the main pollens associated with these diseases.

We conducted an ecological study using web and pollen count data available for Lisbon (Portugal) from 2007 to 2012 (6 years). Pollen count data were collected from Lisbon’s monitoring station (Mediterranean climate; Csa Köppen-Geiger Climate Classification). Counts and concentrations were analyzed using the Hirst volumetric method, following a standardized protocol from the International Association of Aerobiology. The following pollens were analyzed: Betulaceae, Castanea, Chenopodiaceae, Compositae, Cupressaceae, Myrtaceae, Olea, Palmae, Parietaria, Pinaceae, Plantago, Platanus, Poaceae, Quercus suber, Quercus, Rumex, Salix, Umbelliferae, and Urtica. GT works by analyzing how many Google searches are done for the terms entered relative to the total number of searches in the same time period and region. GT results were extracted for rhinitis and asthma search terms in the Lisbon region from 2007 to 2012. As the GT search index was only available for monthly periods, we calculated average monthly pollen counts based on the daily data available. Total pollen count trends were transformed using a similar methodology to that of GT to allow comparisons with GT indices and to present the results graphically using a scale of 0 (minimum during study period) to 1 (maximum) [6]. The pollen count index at a specific time point corresponds to the ratio between pollen counts at that point and maximum pollen counts during the study period. Subsequently, GT results for rhinitis and asthma were correlated with total pollen counts using Spearman’s rank-order correlation, after confirming a monotonic relationship. Pollens with peak levels lower than 30 grains/m³—the clinically relevant cutoff—were excluded. Spearman’s rank-order correlation coefficients were categorized as follows: 1-0.75, strong correlation; 0.75-0.25, moderate correlation; and 0.1-0.25, weak correlation. A significance level of α=0.05 was used although P values of over .05 and under .10 were also considered.

From 2007 to 2012, the median total pollen count was 43.8 grains/m³ (interquartile range, 19.8-200.3 grains/m³). The main pollens identified in the study period, expressed as a percentage of total pollens, were Urtica (18.3%), Cupressaceae (15.1%), Olea (12.9%), Parietaria (10.9%), and Quercus (10.2%). Total pollen counts and search trends for rhinitis showed a cyclical seasonal pattern, with peaks in spring months (March-June). Asthma search trends showed a similar, though less pronounced, pattern. Total pollen counts and search trends for asthma and rhinitis during the study period are presented in the Figure. Total pollen count had a statistically significant positive correlation with the GT search index for rhinitis (r=0.366; P<.002; moderate) and asthma (r=0.305; P=.009; moderate). The following pollens, based on the cutoff of over 30 grains/m³, were analyzed in GT: Cupressaceae, Olea, Parietaria, Platanus, Poaceae, Quercus suber, Quercus, and Urtica. Individual pollen counts with a statistically significant correlation with the GT search index for asthma were Cupressaceae (r=0.402; P<.001; moderate), Platanus (r=0.255; P=.031; moderate), Quercus (r=0.337; P=.004; moderate), and Urtica (r=0.432; P<.001; moderate). The same individual pollens were identified for rhinitis: Cupressaceae (r=0.461, P<.001, moderate), Platanus (r=0.285, P=.015, moderate); Quercus (r=0.231, P=.051, weak); and Urtica (r=0.431, P<.001, moderate).

The pollen levels and main pollen species identified in this study are comparable to findings previously reported for Lisbon and Mediterranean areas of Europe [9]. Associations between total pollen counts and web searches for rhinitis have been previously reported [7,8], although this is the first study to compare searches in a language other than English or German and in an area with a Mediterranean climate. Moreover, to the best of our knowledge, our study is the first to analyze the correlation between specific pollens and web searches for asthma and rhinitis. A weaker though still significant
correlation was found between total pollen counts and the GT search index for asthma. One possible explanation for this weaker correlation is that the second peak period detected in winter months was probably associated with respiratory infections, an important asthma trigger [3]. The specific pollens that were significantly and positively correlated with web searches for rhinitis and asthma (Cupressaceae, Platanus, Quercus, and Urtica) are not a common cause of respiratory allergic disease in Portugal. Several explanations for this discrepancy are possible, including the fact that pollens contain different components that can stimulate an innate immune response [10] and that these pollens are more “visible”, perhaps bringing patients to believe that they are responsible for their symptoms.

Our results indicate that patients with AR and asthma seek information about their diseases on the Internet, especially in pollen seasons. Little, however, is known about which online sources patients use for this purpose. As the preferential, or top-ranking, websites identified by search engine algorithms could be erroneous, special attention should be paid to the reliability and quality of websites providing medical information.

In conclusion, total pollen counts are significantly correlated with web searches for information on rhinitis and asthma, independently of the search language or climate area. Website monitoring is important for patients and the medical community and GT may constitute an essential tool for predicting asthma and AR outbreaks.

Acknowledgments

Portuguese Aerobiology Network and Portuguese Society of Allergy and Clinical Immunology (SPAIC).

Figure. Total pollen counts and Google Trends search indices for asthma and rhinitis during study period (2007-2012).

Funding

The authors declare that no funding was received for the present study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

Electroconvulsive Therapy in Patients with C1 Inhibitor Deficiency: A Major or Minor Procedure?

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Electroconvulsive therapy (ECT) has been used for the treatment of psychiatric conditions since the 1940s. Although considered controversial in the past, ECT has proven effective for severe depression, schizophrenia, bipolar disorder, and other psychiatric conditions [1]. The procedure involves the application of a small electric current to produce a generalized cerebral seizure under general anesthesia and is repeated at least 6 to 8 times before evaluating the clinical response [2].

Hereditary angioedema (HAE) is a genetic defect caused by a lack of the protein C1 esterase inhibitor (C1-INH). The disease progresses with repeated episodes of swelling in the feet and hands, and may be life-threatening. Angioedema attacks can be induced by physical trauma, including invasive medical or surgical procedures [4]. Clinical guidelines for management of HAE recommend short-term prophylaxis before performing these procedures. The type of prophylaxis depends on the procedure (major or minor) and the patient [5,6]. There is no previous published experience of management of HAE C1-INH in patients who require ECT. Therefore, the technique has not been classified as a major or a minor procedure.

We present our experience in the management of a 57-year-old woman with HAE who was prescribed ECT for major depression. The patient was referred to the Allergy Department of Hospital Universitario Nuestra Señora de Candelaria, Tenerife, Spain in 2004 because of monthly episodes of swelling in her feet and hands since she was 16. In addition, she had experienced repeated episodes of abdominal pain, and laparotomy revealed no significant findings.

C1-INH levels and activity were below normal values in at least 2 determinations, and a diagnosis of HAE was established. Treatment with stanozolol 2 mg daily was initiated, and the patient’s condition gradually improved. The frequency and severity of the attacks decreased considerably to 1 mild episode per year, with no need to visit the emergency department or receive purified C1-INH.