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# Year-long trends of airborne pollen in Argentina: More research is needed

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*TO THE EDITOR*

Many seasonal allergic diseases are triggered by airborne pollen, imposing a significant burden on healthcare systems, with recent trends indicating an increase in the prevalence of atopic conditions such as allergic rhinitis, conjunctivitis, and asthma.[1,2] There is also emerging evidence to suggest that climate change, through changes in minimum or maximum temperatures, may be related to pollen season timing.[3]

Most studies related to airborne pollen and patterns of sensitization are mainly from the northern hemisphere and developed regions, where there are different geographical and atmospheric conditions that play a role in the distribution and patterns of airborne pollen, and they might limit the extrapolation of these findings to southern regions and developing countries.[4] In the case of Argentina, literature related to the prevalence of allergic diseases and airborne allergens is relatively sparse. A recent cross-sectional survey in the country found a high prevalence of self-reported symptoms of allergic rhinitis among adults and children.[5] In another study, it was found that among patients with seasonal allergic rhinitis there was a high frequency of sensitization to grass pollen extracts.[6]

Airborne pollen counters approximate human exposure to atmospheric pollen, and although not an exact representation of the antigenic challenge allergic individuals face, there is evidence indicating a positive correlation between allergic symptoms and the atmospheric pollen concentration.[7] There are few studies of airborne pollen in Argentinian cities. In one study from Bahia Blanca, from 2010, the highest concentrations occurred from August to December, accounting for 80% of the total annual pollen.[8] On the other hand, in a 2018 study at the city of San Salvador de Jujuy, of the 56 pollen types detected during a one-year sampling, 15 had allergenic potential and were present in a significant percentage.[9] The aim of this letter is to contribute to the current literature by describing the seasonal patterns and peaks of various pollen types during a 1-year period across 4 cities in Argentina, thus serving as a reference for allergists for the management of patients, and encouraging further research needed in the field.

In order to ascertain the daily average pollen concentration per cubic meter of air, we studied 4 locations in Argentina (Bariloche, Cordoba, Bahia Blanca, and Santa Rosa) from September 2018 to September 2019. Sample was collected using Rotorod® impact samplers at a minimum of 3 days per week. Pollen concentrations were further classified into 3 categories resembling the National Allergy Bureau (NAB) charts: tree, grasses and weed pollen. An average pollen concentration per NAB category was reported in a monthly basis, as well as an annual average sum per NAB

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| Location/Pollen count | N, (%) |
|---|---|
| *Bariloche total pollen concentration* | 959 |
| Tree pollen concentration | 931 (97.0) |
| Grass pollen concentration | 21 (2.2) |
| Weed pollen concentration | 7 (0.8) |
| *Cordoba total pollen concentration* | 853 |
| Tree pollen concentration | 681 (79.9) |
| Grass pollen concentration | 75 (8.8) |
| Weed pollen concentration | 97 (11.3) |
| *Santa Rosa total pollen concentration* | 506 |
| Tree pollen concentration | 373 (73.6) |
| Grass pollen concentration | 120 (23.7) |
| Weed pollen concentration | 14 (2.8) |
| *Bahia Blanca total pollen concentration* | 282 |
| Tree pollen concentration | 200 (71.1) |
| Grass pollen concentration | 48 (16.9) |
| Weed pollen concentration | 34 (12.0) |

**Table 1.** Annual pollen concentration per location

category and total.[10] Descriptive statistics were performed.

From all locations, Bariloche presented the highest annual average pollen concentration (N = 959) closely followed by Cordoba, whilst Bahia Blanca reported the lowest concentration (Table 1). In all the locations the tree pollen concentration represented the highest proportion of air particles, followed by grasses and weed pollen concentration. Moreover, during the spring season the pollen concentration was superior compared to the rest of the year, with August and October being the months with the highest concentration of pollen particles per cubic meter (Fig. 1).

Allergic diseases are medical conditions of high morbidity, either by representing an impairment in quality of life or a significant economic burden.[11–14] Several strategies are considered to successfully manage these diseases, such as secondary prevention, which plays a pivotal role through a proper identification of allergic triggers leading to less exacerbations and better control.[15] Specifically, speaking in the setting of pollen sensitization, environmental control is recommended and can be achieved indoors and outdoors by preventing pollen from spreading into the house and restricting outdoor exposure, respectively.[16]

Even though it is certain that increased pollen exposure is correlated with a higher prevalence of allergic rhinitis and asthma, the role of climate change with the corresponding fluctuations in pollen concentration and the prevalence of allergic diseases is more circumstantial.[17–19] In North America, seasonal allergies usually begin in spring, where trees start to flower and spread their allergenic pollen into the air.[1] In this report, we described that the total pollen concentration in the 4 locations studied showed to be at its peak during the spring season, with a markedly higher proportion of tree pollen compared to grasses and weed pollen, particularly in Bariloche.

Of note, the value of pollen concentration does not rely on measuring the overall total particles suspended in the air but rather on reporting the specifics of each type of pollen. In other publications specific measures of pollen grains/m3 have been identified to serve as thresholds that trigger symptoms of asthma, allergic rhinitis or conjunctivitis, symptoms scores, or medication use. For instance, in a prospective study involving 430 children, the authors found that a weed exposure as low as 6 to 9 pollen grains/m3 were enough to trigger symptoms.[20] In our study, weed pollen concentrations were below this threshold during the whole year in most locations. Interestingly, in Bahia Blanca only, the average weed pollen concentration reached such

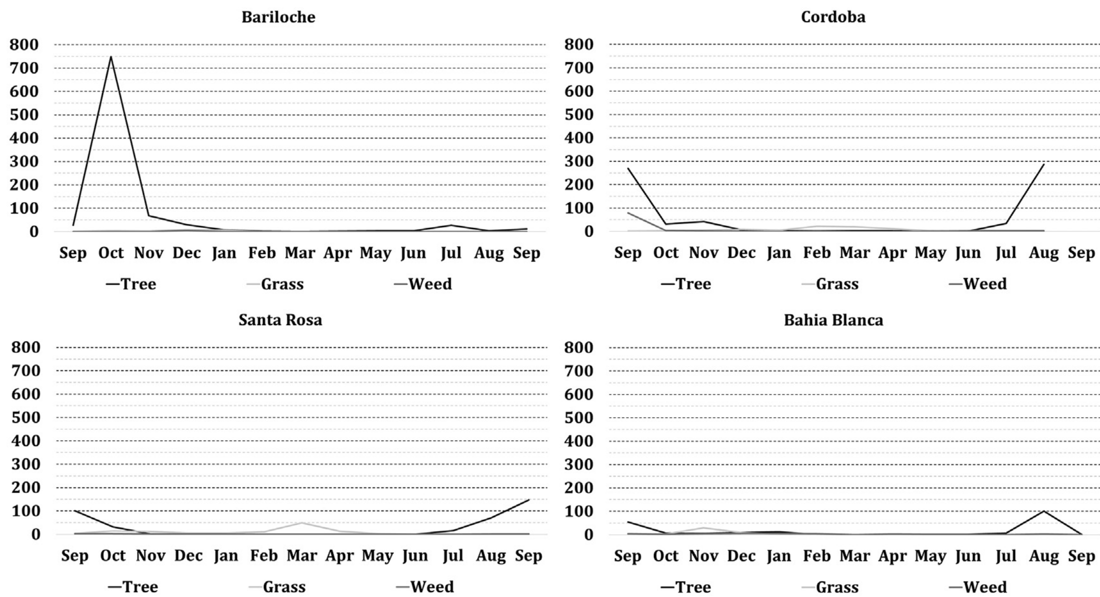


**Fig. 1** Monthly average pollen concentration per category and location

threshold during the summer season. In another study by Comtois and colleagues,[21] in Canada, 8 to 23 grains/m3 of tree pollen were found to trigger symptoms in patients with history of atopy. Even though in our report the tree pollen concentration showed to be above this threshold mostly during spring, the winter season also present elevated levels throughout the 4 locations.

However, and perhaps of most clinical relevance, is the fact that according to the NAB scale, grass pollen were between low (1–4 pollen grains/$m^3$) to high (20–199 pollen grains/$m^3$) levels in all the 4 locations during spring and summer, with locations like Cordoba and Santa Rosa extending such observation to fall.[10] Even though it is not under the scope of this study, it is likely that the prevalence of allergic diseases follows this pattern, since it has been reported in Argentina that grass allergen extracts induce the strongest positive reactions when compared to tree and weed extracts; grass have high cross-reactivity between them and only 4 pollen grains/$m^3$ are required to elicit a response, all of which represent factors that favor hypersensitivity.[6,21,22]

In conclusion, peak pollen concentrations were observed during the spring season, particularly during August and October. In all the locations studied, tree pollen represented the highest proportion of air particles, followed by grass and weed pollen. The prevalence of allergic diseases is likely to follow the grass pollen concentration distribution. However, there are still unmet needs in the study of pollen in Argentina, mainly: 1) assessing whether pollen seasonality is associated with allergic disease exacerbations, 2) the sensitization of allergic patients to specific types of extracts, 3) the relationship between climate change and contamination on pollen concentration, 4) the standardization of pollen reports, and 5) the development of a national pollen map.

## Abbreviations

National Allergy Bureau: (NAB)

## DECLARATIONS

### Ethics approval and consent to participate

This study was approved by the ethics committee Comité de ética e Investigación en Seres Humanos (CEISH) in accordance to the principles established by the declaration of Helsinki.

### Consent for publication

Not applicable.

### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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### Author's contributions

Authors have made substantial contributions to conception and design, acquisition, and analysis and interpretation of data, and have been involved in drafting the manuscript or revising it critically for important intellectual content, and given final approval of the version to be published. GDR, LBB, AMK, MB, MSR, SG, CO participated in the data recollection process. EV, MF wrote the manuscript. GDR, EV, MF, ICO revised the final draft. All authors read and approved the final version.

### Declaration of Competing Interest

In relation to this work authors declare no relevant conflicts of interest.

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