

Is environmental pollen concentration a risk factor for SARS-CoV-2 infection?

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Dear Editor:

Since a new betacoronavirus finally named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)[1] emerged in Wuhan, People's Republic of China, in late 2019 and the World Health Organization (WHO) declared a pandemic situation for COVID-19 on 11 March 2020, the number of cases have progressively increased until today, 30 April 2021, with a total of 153.632.235 million infected and 3.215.270 million dead [2].

In this context, there have been publications linking the SARS-CoV-2 infection rate to the pollen concentration in a area, the most recent one made by Damialis et al. in 31 countries around the world [3]. This theory may be supported by studies indicating that pollens, regardless of their allergenic potential, possess the ability to suppress antiviral immunity by weakening the immune system against respiratory viruses [4]. At cellular level the eosinophil, especially eosinopenia, has been described as a relevant factor in COVID-19, although further studies are needed to confirm and clarify its role in this emerging disease [5].

On the other hand, articles such as that of Hoogeveen et al. have also appeared, concluding that pollen is an inverse predictor of respiratory infections, including COVID-19 [6].

In our opinion, it seems to us that this statement made by the Damialis group at a global level does not bear any relation to what we have observed in Spain, since, as it is a pathology that occurs in waves, at some point a period of pollination may coincide with a certain increase in cases, so we believe that chance has more weight in this relationship than an increase in pollens in the environment. In addition, we believe that the work of the Damialis group is only assessing 1 month of pollination, which could lead to a biased assessment, as it would be interesting to assess over a whole year of pollination.

For this reason, we have proposed a retrospective longitudinal study to interpret the relationship between daily cases of SARS-CoV-2 infection and the concentration of total pollens per day in our geographical area. To this end, we have collected the total daily pollen concentration in 14 Spanish cities (Madrid, Barcelona, Valencia, Sevilla, La Coruña, Oviedo, Burgos, San Sebastian, Logroño, Zaragoza, Pamplona, Murcia, Toledo and Cáceres) from 1 March 2020 to 28 February 2021, as well as the daily incidence of COVID-19 cases in these 14 Spanish provinces. We have chosen this series of cities to obtain a heterogeneous sample of the Spanish population, and the dates chosen represent the first year of the pandemic in our country.

The pollen data were collected from the website www.polenes.com of the Aerobiology Network of the Spanish Society of Allergology and Clinical Immunology (SEAIC), while the data on infections per province/day were obtained from the website of the Spanish Ministry of Health, Consumption and Social Welfare.

Once these data were available, a Spearman correlation was performed to see if there was a significant relationship between total pollen concentrations and cases of SARS-CoV-2 infection.

In the results we have obtained we can see that when we relate the daily cases of COVID-19 with the daily concentration of pollen in the provinces analysed, all of them have a negative correlation coefficient, which would rule out this relationship. Furthermore, when carrying out the statistical analysis of the data we found that in the provinces studied there is no significant relationship between the daily cases of COVID19 and the total daily concentration of pollens with a value of $p < 0.01$.

As an example we observe that in Toledo the day of highest pollen incidence is 24 May 2020, while the peak of COVID-19 cases is 20 January 2021. Similar examples can be seen in table 1 (supplementary material) where it can be seen that there is no relationship between the peak day of pollen and the peak day of COVID19 cases in the provinces studied, nor between the total numbers of pollen and the total numbers of COVID19 cases. Image 1 (supplementary material) shows the relationship between daily COVID19 cases and total pollen concentrations in the year studied in the province of Toledo.

As a conclusion of the study we observe that, in the 14 Spanish provinces analysed, the number of daily cases of SARS-CoV-2 infection is not significantly related to the total

daily pollen concentration in the environment. Therefore, we can affirm that, in our country at the present time, there is no relationship between the concentration of total pollens, regardless of whether or not they are allergenic, with the cases of COVID-19.

Finally, we would like to thank those responsible for the SEAIC Aerobiology Network stations named in the article for providing the aerobiological data and thank also Dr. Pedro Beneyto for analyzing the data.

Conflict of interest

The authors declare that they do not have a conflict of interest

Financial sources

The authors declare that they do not have financial sources

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Figure 1

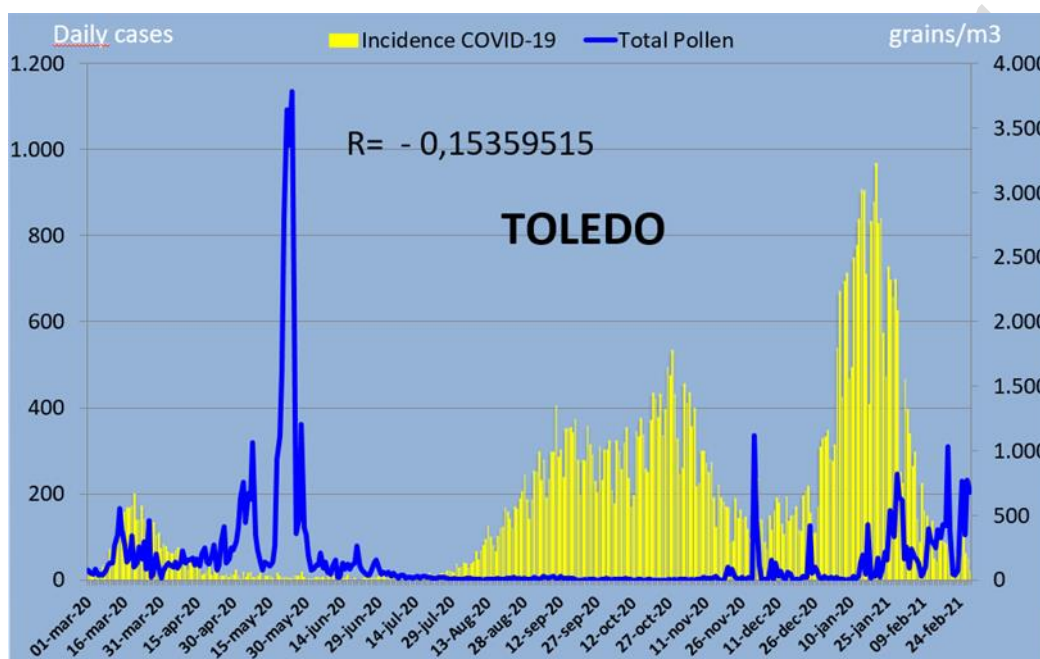
	Peak pollen day	Peak day COVID19 cases	Total pollen	Total COVID19 cases	Total pollen VS Total COVID19 cases (Spearman)
Barcelona	18 February 2021	20 October 2020	61.385 grains/m ³	372.428	- 0,2 (p<0,01)
Valencia	9 March 2020	15 January 2021	36.573 grains/m ³	197.243	- 0,19 (p<0,01)
Murcia	2 March 2020	12 January 2021	29.447 grains/m ³	52.974	- 0,35(p<0,01)
Sevilla	24 April 2020	22 January 2021	25.169 grains/m ³	99.754	- 0,18 (p<0,01)
Logroño	4 May 2020	21 January 2021	15.256 grains/m ³	27.166	- 0,04 (p<0,01)
Madrid	27 January 2021	19 January 2021	39.329 grains/m ³	591.484	- 0,12 (p<0,05)
Toledo	24 May 2020	20 January 2021	60.636 grains/m ³	63.283	- 0,16 (p<0,01)
Oviedo	27 June 2020	10 November 2020	12.763 grains/m ³	43.927	- 0,31 (p<0,01)
Pamplona	5 May 2020	19 October 2020	28.548 grains/m ³	51.639	- 0,17 (p<0,01)
Zaragoza	15 March 2020	1 August 2020	19.905 grains/m ³	76.833	- 0,21 (p<0,01)
Cáceres	15 March 2020	13 January 2021	35.763 grains/m ³	22.873	- 0,23 (p<0,01)
San Sebastián	14 February 2021	1 November 2020	18.108 grains/m ³	51.398	- 0,21 (p<0,01)
Burgos	28 May 2020	5 November 2020	18.952 grains/m ³	29.145	- 0,24 (p<0,01)
La Coruña	28 May 2020	18 January 2021	22.419 grains/m ³	50.139	- 0,25 (p<0,01)

Table 1 shows, in each province studied, the peak day of total pollen concentration, the peak day of COVID19 cases, as well as the total pollen concentration and COVID19 cases between the dates analysed. As we can see, there is no relationship between the peak pollen day and the peak day of COVID19 cases in the provinces studied, as most provinces have the peak of COVID19 in January while the peak of pollen is obtained in spring.

There is also no relationship between the total pollen counts and the total number of COVID19 cases, for example, the relationship between Burgos and San Sebastian, where, although the total pollen concentration is similar, the number of total COVID19 cases is almost twice as high in San Sebastian as in Burgos. Something similar, although more accentuated, occurs between Toledo and Barcelona since, presenting similar total pollen concentrations, the number of cases in Barcelona is six times higher than in Toledo.

This data would reinforce our theory that the coincidence of the increase in COVID19 cases and the increase in total pollen concentration is solely due to the pattern of both variables.

Image 1



In image 1 we can see the graph corresponding to the province of Toledo in which a correlation between total daily pollen concentrations and daily cases of COVID19 between 1 March 2020 and 28 February 2021 is carried out. As we can see, the relationship coefficient is negative with a value of -0.15, which would indicate that there is no relationship between the variables to be correlated. Furthermore, when carrying out the statistical analysis of the data, we found that there is also no significant relationship between the daily cases of COVID19 and the total daily concentration of pollen with a value of $p < 0.01$.

It is worth noting that in the first wave of COVID19 there is an increase in the number of pollens along with the number of cases, however, this is not found in the second and third waves. This relationship, as we have seen previously, is mainly due to the fact that as it is a pathology that occurs in waves, at some point a period of pollination may coincide with a certain increase in cases, without there being a reliable relationship between the two variables.