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SCIENTIFIC LETTER

Influence of meteorological factors and air pollutants on severe bronchiolitis cases in the metropolitan area of Barcelona: A pilot study☆

Influencia de los factores meteorológicos y contaminantes del aire en casos de bronquiolitis grave en el área metropolitana de Barcelona: estudio piloto

Dear Editor:

In the metropolitan area of Barcelona, as well as in other Spanish cities, air quality is getting worse by the year. At the same time, projections of temperature and rainfall alert us to future increases in both parameters.[1] In this context, studies assessing the influence of climate and air pollution in children, particularly in relation to respiratory diseases, are necessary. A recent systematic review confirmed the association between exposure to air pollutants (particulate matter with diameters >2.5 μm [PM2.5] and >10 μm [PM10], nitrogen dioxide [NO_2] and sulfur dioxide [SO_2]) and the risk of hospital admission due to bronchiolitis.[2] A study conducted in primary health care centres in Madrid concluded that NO_2 levels (particularly those exceeding 40 μg/m^3) were associated with increases in paediatric respiratory disease.[3] To our knowledge, no similar studies have been done in Barcelona.

As a pilot study, we analysed data for 391 patients from the metropolitan area of Barcelona admitted with bronchiolitis to the paediatric intensive care unit of the Hospital Sant Joan de Déu (Esplugues de Llobregat) between 2011 and 2016. We used the postal code of each patient to add the monthly average temperature and humidity values to the database. We also added the value of the air quality index (''Index Català de Qualitat de l'Aire'', ICQA) 10 days before the date of admission (Barcelona City Council website: https://www.barcelona.cat/ca/; ICQA website: http://dtes.gencat.cat/icqa/?elementsComparacio=ICQA_Municipi&periode=Setmana).

Using the information collected in the database, we found no differences between the years under study in the demographic and clinical characteristics of the patients (Table 1). We conducted time series analyses to identify trends in the number of bronchiolitis cases, temperature and humidity. After adjusting for the effect of seasonality, we found a significant increasing trend in the incidence of bronchiolitis and a significant decreasing trend in the temperature between 2011 and 2016 (Fig. 1). However, the values of adjusted R2 in the regression analyses were less than 10% in both cases. We found no differences in humidity between the years under study.

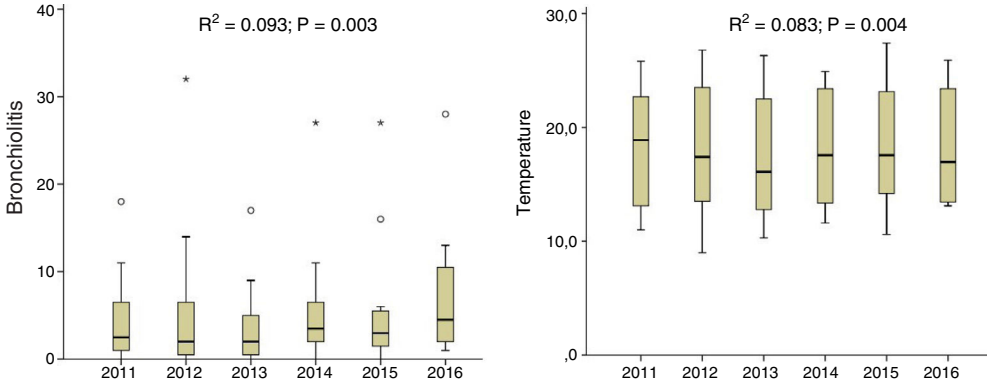

Figure 1 Box plots of cases of bronchiolitis and temperature for each year under study. Each graph shows the adjusted R^2 values of the additive models fitted in the regression analysis.

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Table 1 Total number of patients admitted to the PICU of the Hospital Sant Joan de Déu with bronchiolitis from 2011 to 2016. The clinical and demographic data correspond to patients residing in the metropolitan area of Barcelona (MAB).

Parcheos	Change the decimal points to commas in the Spanish version
Total PICU admissions	Total ingresos UCIP
P	*p*-valor
Bronchiolitis cases (%)	Casos de bronquiolitis (%)
Bronchiolitis cases MAB (%)	Casos de bronquiolitis AMB (%)
Age in days, N	Edad en días, N
Median	Mediana
IQ25	P25
IQ75	P75
Male sex	Sexo, varón (%)
Infection (%)	Infección
RSV	VRS
Other[c]	Otra[c]
Overinfection[d] (%)	Sobreinfección[d] (%)
Pneumonia (%)	Neumonía
Previous bronchiolitis (%)	Bronquiolitis previa
Relevant history (%)	Antecedentes
None	Ninguno
Preterm birth	Prematuridad
Other[c]	Otro[c]
Hospital stay, days	Estancia hospitalaria, días
Median	Mediana
IQ25	P25
IQ75	P75
PICU stay, days	Estancia UCIP, días
Median	Mediana
IQ25	P25
IQ 75	P75
PRISM[D] score	Escala PRISM[f]
Median	Mediana
IQ25	P25
IQ75	P75
BROSJOD[g] score	Escala BROSJOD[g]
Median	Mediana
IQ25	P25
IQ75	P75

BROSJOD, bronchiolitis severity scale of the Hospital Sant Joan de Déu; PRISM III, Paediatric Risk Score of Mortality III; RSV, respiratory syncytial virus.
[a] Mann–Whitney *U* test; [b]Chi square test; [c]Other: rhinovirus, metapneumovirus, flu, adenovirus, coronavirus, enterovirus, human bocavirus or *Bordetella*; [d] *Haemophilus* and *Moraxella*; [e]Other: heart disease, neurologic disease, lung disease or other diseases.

As for the relationship between bronchiolitis and air quality, we observed that the median value of the ICQA on the days with bronchiolitis cases was always within the acceptable range (medians ranging from 50 to 65) with no significant differences between years (Table 2). The median values of the global ICQA in the metropolitan area of Barcelona were similar (medians from 55 to 60) to those observed on the days with cases of bronchiolitis. The pollutant most strongly associated with bronchiolitis cases in the metropolitan area of Barcelona was NO_2.

Table 2 Air quality values on days with bronchiolitis cases from 2011 to 2016.

Parcheos	Change the decimal point from p-value to comma in the Spanish version
P	*p*-valor
ICQA[a]	ICQA
Min/Max	Min/Max
Median	Mediana
IQ25	P25
IQ75	P75

[a] Catalan Air Quality Index); Mann–Whitney *U* test.

The main limitations of this study are the substantial dispersion of cases within the metropolitan area, which posed challenges to the retrieval of environmental data. The heterogeneity found in the databases available for temperature and ICQA, with an insufficient number of weather monitoring stations in some areas and the closure of some stations from 2011 to 2016, have also limited the analyses.

Neither temperature nor pollutants seem to have had an impact on the incidence of bronchiolitis in the metropolitan area of Barcelona from 2011 to 2016. During these years, the city showed sustained pollution levels corresponding to 1.3–1.5 times the recommended limits of the WHO for NO_2 and particulates.[4] The fact that these pollution levels were sustained over time may explain why our study did not find an association with pollutants, as opposed to the results reported in the United States, where bronchiolitis cases were associated with high values of PM10 due to the presence of steel mills and geographical areas with episodic pollution.[5,6] Although we have not detected differences in the distribution of the main pollutants between days with bronchiolitis cases and the rest of the month, it is important to underline that NO^2 is the main pollutant present throughout the year in the metropolitan area of Barcelona. This pollutant has already been associated with increased paediatric respiratory disease in Madrid.[3] Further studies with larger databases including recent data are needed to understand the relationship between bronchiolitis and the environment.

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Distribution of tuberculosis incidence rates in children under 15 years old according to poverty areas in Seville☆

Distribución de las tasas de incidencia de tuberculosis en menores de 15 años según zonas de pobreza de la ciudad de Sevilla

Dear Editor:

In May 2014, the World Health Assembly approved the action framework of the World Health Organization (WHO) *Towards tuberculosis elimiation*[1] with the objective of eliminating tuberculosis (TB) as a global health problem by 2035. This would require a 95% reduction in TB mortality and a 90% reduction in its incidence relative to 2015. The action framework includes policy and budget measures at the national and international levels ranging from guaranteeing universal access to health care to addressing the social and economic factors that have an impact on this disease.[2] Tuberculosis is associated with poverty, social exclusion and inequality, and there is evidence that factors such as low educational attainment, unemployment and low socioeconomic status (SES) are associated with an increased incidence and prevalence of TB.[3]

Low-resource countries have the highest incidence of TB and the highest associated mortality. Nevertheless, the action framework of the WHO also includes strategies for low-incidence countries (fewer than 10 cases/100 000 inhabitants/year) such as Spain.[2] According to the latest report of the *Red Nacional de Vigilancia Epidemiológica* (Spanish National Network of Epidemiological Surveillance), the overall incidence of TB in Spain in 2016 was 10.38 cases per 100 000 inhabitants (4.10 in children aged less than 15 years).[4] The incidence in the population aged less than 15 years in Spain in years 2013, 2014 and 2015 was of 5.33, 4.35 and 5.05 cases per 100 000 inhabitants, respectively. Although there is a decreasing trend in the incidence of TB nationwide, the incidence is decreasing by less than 11% per year (the target established by the WHO).

In order to analyse the distribution of cases of TB in children aged less than 15 years living in Seville based on the SES of the neighbourhoods where they resided, we calculated the annual incidence of cases of TB in children notified to the Department of Epidemiology of the Health District of Seville of the Department of Health of Andalusia in years 2013, 2014 and 2015. We obtained data on the geographical distribution by administrative subdistricts of the city of Seville and the total population aged less than 15 years residing in each subdistrict through the *Urban Audit Project* of the Instituto Nacional de Estadística (National Institute of Statistics).[5] Since data for the population distribution by subdistrict was not available for 2014, we calculated the incidence for 2014 using the population distribution of 2013. We defined low-SES subdistricts as those containing 1 or more of the areas established as *areas in need of social transformation* (ANSTs) in the city of Seville based on the classification of residential areas with structural poverty

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