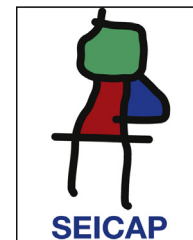




# Allergologia et immunopathologia

Sociedad Española de Inmunología Clínica,  
Alergología y Asma Pediátrica

[www.elsevier.es/ai](http://www.elsevier.es/ai)



## ORIGINAL ARTICLE

# Can meteorological factors forecast asthma exacerbation in a paediatric population?

D. Hervás<sup>a,b,\*</sup>, J.F. Utrera<sup>b</sup>, J. Hervás-Masip<sup>a</sup>, J.A. Hervás<sup>a</sup>, L. García-Marcos<sup>c</sup>

<sup>a</sup> University Institute of Health Sciences-IUNICS, University of the Balearic Islands, Spain

<sup>b</sup> Department of Paediatrics, Inca Hospital, Mallorca Spain

<sup>c</sup> Respiratory Medicine and Allergy Units, Virgen de la Arrixaca University Children's Hospital, University of Murcia, Spain

Received 10 June 2013; accepted 6 July 2013

Available online 26 October 2013

### KEYWORDS

Humidity;  
Barometric pressure;  
Wind speed;  
Climate;  
Asthma exacerbation;  
Epidemiology

### Abstract

**Background:** Asthma exacerbations attended in emergency departments show a marked seasonality in the paediatric age. This seasonal pattern can change from one population to another and the factors involved are poorly understood.

**Objectives:** To evaluate the association between meteorological factors and schooling with asthma exacerbations in children attended in the paediatric emergency department of a district hospital.

**Methods:** We conducted a retrospective review of the medical records of children 5–14 years of age attended for asthma exacerbations during a 4-year period (2007–2011). Climatic data were obtained from a weather station located very close to the population studied. The number of asthma exacerbations was correlated to temperature, barometric pressure, relative humidity, rainfall, wind speed, wind distance, solar radiation, water vapour pressure and schooling, using regression analyses.

**Results:** During the study period, 371 children were attended for asthma exacerbations; median age was eight years (IQR: 6–11), and 59% were males. Asthma exacerbations showed a bimodal pattern with peaks in spring and summer. Maximum annual peak occurred in week 39, within 15 days from school beginning after the summer holidays. A regression model with mean temperature, water vapour pressure, relative humidity, maximum wind speed and schooling could explain 98.4% ( $p < 0.001$ ) of monthly asthma exacerbations.

**Conclusions:** The combination of meteorological factors and schooling could predict asthma exacerbations in children attended in a paediatric emergency department.

© 2013 SEICAP. Published by Elsevier España, S.L.U. All rights reserved.

## Introduction

Asthma is the most prevalent chronic disease in childhood and an important cause of visits to the emergency department (ED).<sup>1</sup> Seasonal exacerbation of asthma is a

\* Corresponding author.

E-mail address: [dhmdhm@hotmail.com](mailto:dhmdhm@hotmail.com) (D. Hervás).

well-known phenomenon especially in children. Johnston and Sears<sup>2,3</sup> studying hospitalisations and ED visits for asthma in Canada found that asthma exacerbations followed a cyclic pattern in school-age children 5–15 years. There was a minor increase through the first six months of the year, then declined during the summer and peaked in September about two weeks after school return from the summer holidays. The patterns in the distribution of asthma exacerbations may be explained by a combination of geographical differences in allergen sensitisation, pollution levels, viral exposure and/or weather conditions. In general, understanding the determinants of asthma exacerbation is poor because of the difficulty in determining exposure to causal factors and the complexity of the interactions between them.<sup>4</sup>

There are not many reports on the association between asthma attacks and specific weather conditions.<sup>5–19</sup> Relative humidity, mean temperature, rainfall, wind speed, sunshine and barometric pressure have been evaluated as a cause of asthma exacerbations in children. However, it is not clear whether climatic factors affect asthma exacerbations directly or indirectly through their effect on other environmental agents. To date, no model based on climatic factors has been able to accurately predict exacerbations of asthma. The aim of this study was to determine the epidemiology of asthma exacerbations in the children attended in a paediatric ED. We evaluated the association of these exacerbations with some meteorological factors and school attendance.

## Materials and methods

### Study population

The study was conducted in the paediatric ED of a district hospital on the island of Mallorca, Spain. From July 1, 2007, to June 30, 2011, the medical records of children 5–14 years of age visited at the ED with a diagnosis of asthma exacerbation were retrospectively reviewed. Diagnosis, age, sex, and date of admission of all children attended were codified prior to their discharge and these data were automatically stored in a computerised database. Subjects were selected from this database after revision of the hospital discharge codes with a primary or secondary diagnosis of asthma exacerbation. The episodes of asthma exacerbation were identified via the International Classification of Diseases, 9th revision, with 493.0-9 discharge codes.

### Meteorological data

During the study period, data on barometric pressure, humidity, wind speed, wind distance, rainfall, global solar radiation and temperature were obtained from the Spanish Meteorology Agency. This agency collects daily information from a weather station located close by at latitude 39.55° N, longitude 2.73° E and 4 m height. Water vapour pressure was obtained using an equation described elsewhere.<sup>20</sup>

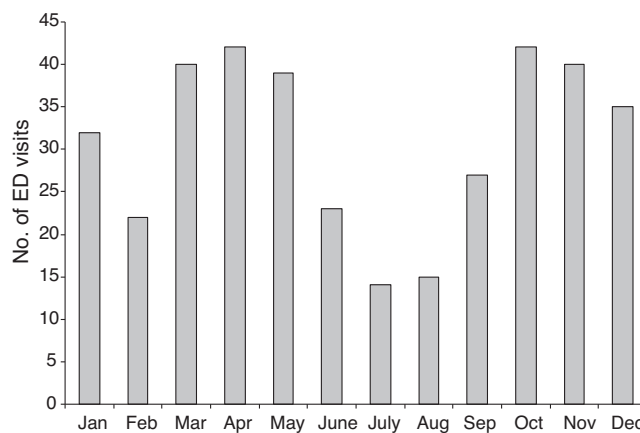
## Data analysis

Descriptive analysis was performed using frequency distributions or rates. All continuous variables were confirmed to be normally distributed, or to have skewness not significantly different from zero. Results are presented as mean  $\pm$  standard deviation (SD) or median and interquartile (IQR) as required. Co-linearity was studied performing tolerance testing. For analyses, variables were paired throughout the 12 months of the year; the meteorological data were the mean of the different monthly means, and asthma exacerbations was the sum of admissions in the ED for this reason during the months of the year. The association between asthma exacerbations and the meteorological variables was determined after multivariate linear regression. Backward elimination method was used for variable selection. The effect of two lag months period was also evaluated. The effect of a unit increase for each independent variable was calculated transforming the  $\beta_i$  coefficients into percentages ( $[\beta_i/N^\circ \text{ asthma exacerbations}] \times 100$ ). To determine the effect of school attendance we considered that one or more weeks of school holidays during a month period could be considered a relevant decrease in schooling. In consequence, a dummy variable that defined schooling as the absence of this holiday period was introduced in the multivariate analyses. Statistical significance was set at  $p < 0.05$ . Data were analysed with the statistical software package IBM SPSS 20.0 (New York, USA).

## Results

### General characteristics and seasonality

From July 1, 2007, through June 30, 2011, 371 children aged 5–14 years were attended at the ED for asthma exacerbation. This accounted for 7.9% of the attended children of this age group in the paediatric ED. The median age was eight years (IQR: 6–11), and 59% were males. The monthly distribution of the children attended for asthma is shown in Fig. 1. Monthly asthma exacerbations showed a bimodal distribution with two annual peaks, one in spring and the



**Figure 1** Seasonality of asthma exacerbations in the paediatric emergency department.

Download English Version:

<https://daneshyari.com/en/article/3339769>

Download Persian Version:

<https://daneshyari.com/article/3339769>

[Daneshyari.com](https://daneshyari.com)