
Recurrent Bronchospasm in Children Treated in the Emergency Department

Marques-Mejias MA^{1,2}, Tomás-Pérez M^{3,4}, Hernández-Martin I³, Loli-Ausejo D³, Quirce S^{3,4,5}

¹*Pediatric Allergy Group, Department of Women and Children's Health, School of Life Course Sciences, King's College London, London, UK*

²*Children's Allergy Service, Evelina London Children's Hospital, Guy's and St Thomas' NHS Foundation Trust, London, UK*

³*Department of Allergy, La Paz University Hospital, Madrid, Spain*

⁴*Hospital La Paz Institute for Health Research (IDIPAZ), Madrid, Spain*

⁵*CIBER de Enfermedades Respiratorias CIBERES, Madrid, Spain*

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Changes in trends of emergency department visits are important epidemiological markers that should be considered when attempting to improve care at any level of the health system [1]. Wheezing is a common symptom in the first year of life [2]. Recurrent wheezing may not be equivalent to asthma. In fact, most children who wheeze during respiratory infections in early life will not develop asthma later in life [2]. The objective of this study was to determine the clinical characteristics of children with recurrent bronchospasm who attended the emergency department over a 1-year period. We followed the cohort for 3 years and recorded the clinical features of the episodes during this time.

We performed a single-center observational, retrospective study. We recruited patients with bronchospasm/wheezing who attended the pediatric emergency department (PED) of Hospital Universitario La Paz, Madrid, Spain during 2015 (January 1 to December 31). After a database search of patients under *wheezing*, *asthma exacerbation*, and *bronchospasm*, we included patients with 3 or more episodes registered during the year of study. We then collected information regarding these patients' visits to the PED during the following 3 years (2015-2018). Clinical and demographic data obtained at each visit were collected from the PED computer system and the hospital medical records. The Ethics Committee of Hospital Universitario La Paz approved this study (code HULP: PI-2347).

Findings were presented using descriptive statistics, including mean and interquartile ranges for continuous variables and frequency and percentage for categorical variables. The analysis was performed using SPSS Version 3.4.3. ANOVA was used for intergroup comparisons. Statistical significance was set at $P < .05$.

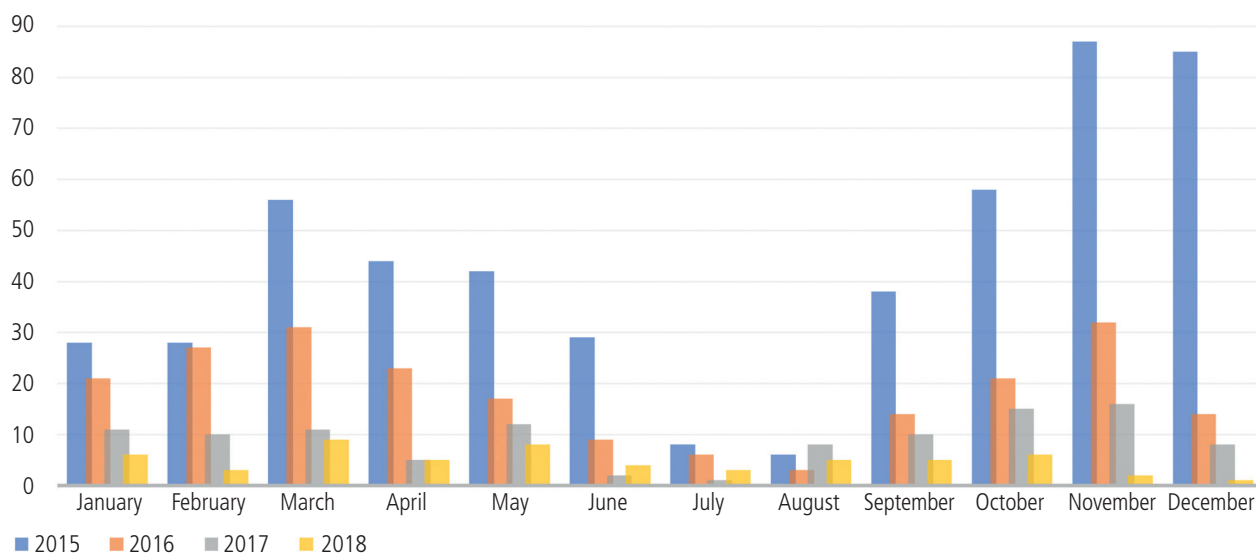


Figure. Annual distribution of bronchospasm episodes treated in the pediatric emergency department from 2015 to 2018.

Of 2609 patients registered during 2015 under bronchospasm/wheezing/asthma exacerbation, 129 had been admitted to the PED ≥ 3 times. The children included were between 0 and 13 years old (mean [SD], 2.58 [2.43]). The distribution of episodes per patient was as follows: 72/129 (55.8%) had 3-4 episodes, 54/129 (41.9%) had 5-6 episodes, and 3/129 (2.3%) had 7-8 episodes. The distribution by sex was 41.9% female and 58.1% male. We recorded a total of 377 episodes in 2015, 176 episodes in 2016, 97 episodes in 2017, and 41 episodes in 2018.

Triggers per visit were collected from emergency department medical records. Infections were recorded as the possible cause in 66.89% of the visits, unknown causes in 32.4%, insect stings in 0.59%, and foods in 0.2%.

The distribution of visits per year is shown in the Figure. Episodes that required hospital admission were as follows: 103/377 (27%) in 2015; 40/176 (22%) in 2016; 10/97 (10%) in 2017; and 16/41 (39%) in 2018. Episodes requiring admission to the intensive care unit (ICU) decreased from 14 admissions in 2015 to 0 admissions in 2018 (2 episodes required admission to the ICU each year during 2016 and 2017). Most episodes that required admission to the ICU were registered during March 2015, followed by November and October of the same year.

Of the patients studied, 31 (24%) were referred or under the care of an allergist. Of these, 46.8% had been diagnosed with bronchospasm and other clinical entities such as anaphylaxis (4; 12%) and urticaria (3; 9%). Patients studied in the allergy department were sensitized to pollen (14 [45%]), animal dander (13 [41%]), mold (3 [9.6%]), house dust mite (4 [13%]), and lipid transfer protein/profilin (3 [9.6%]). Of the patients sensitized to pollen, 55.6% were sensitized to 2 or more pollens at the time of assessment. More than 50% of patients sensitized to animal dander were sensitized to both cats and dogs.

Diagnosis of asthma in children younger than 5 years is challenging [3]. In its latest edition, the Global Initiative

for Asthma proposes a scale of probability of asthma to be applied in this age group. In this sense, children with more than 3 episodes/year, severe episodes, nocturnal worsening, or respiratory symptoms for more than 10 days after a respiratory infection are more likely to have asthma than those who do not meet these criteria [3].

Even though lung development starts early in gestation, it continues throughout childhood [4]. Therefore, in children, the lung is susceptible to factors that might affect its growth [5]. An asthma exacerbation is defined as an increase in inflammation in the airway that limits airflow and triggers asthma symptoms [5,6]. These episodes increase emergency department visits and hospital admissions and reduce the patient's quality of life [7].

There were more males in the study sample, although the difference was not statistically significant. Published data show this to be expected, since males tend to wheeze and develop asthma more frequently than females until the age of 16 [2].

We recognized a pattern of prevalence of infectious diseases as triggers in most episodes in our sample; this finding is in line with data reported elsewhere [8,9]. When predicting respiratory infection, PED doctors should consider epidemiological characteristics of the sample such as age, month of PED admission, contact with infectious cases, and nursery attendance. However, microbiological confirmation should be performed to determine causality.

In this cohort, the number of episodes of attendance at the PED and the severity of cases decreased from 2015 to 2018. In a retrospective study, it is not possible to establish the reason for this finding, although we could argue that it is linked to aging and lung maturity.

The persistence of wheeze in children could result from activation of inflammatory pathways secondary to infections and aeroallergen exposure, which in turn affects the normal development of the airway [10]. In this sense, airway modifications can trigger phenotypical changes that can leave

the child prone to persistent wheeze [11]. While there is an individual risk of developing persistent wheeze and asthma, this is affected by respiratory infections in the first year of life and allergic sensitizations [12].

Persistent wheezers are clearly more susceptible to allergic triggers of asthma [2]. Bearing in mind that many asthma patients worsen due to preventable factors [13], one of the fundamental learning points of our analysis is the lack of referral to the allergy department in more than half of a sample with more than 3 visits to the PED with bronchospasm in 1 year. It is important to follow these patients up and to determine possible causes of treatment failure and additional asthma exacerbations.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

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M Andreina Marques-Mejias

Children's Allergy Service
Evelina London Children's Hospital
Guy's and St Thomas' NHS Foundation Trust
London SE1 7EH
United Kingdom
E-mail: Mandreina.marques@gmail.com