

Recurrent bronchospasm in children attended in the emergency room

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Changes in the trends of visits to emergency services represent important epidemiological characteristics to consider in order to improve care at any level of the health system[1] In the first year of life, wheezing is a common symptom.[2] Recurrent wheezing may not be the same as asthma. In fact, the majority of children that wheeze in early life during respiratory infections will not develop asthma later in life. [2] The objective of this study was to determine the clinical characteristics of children with recurrent bronchospasm that attended the emergency department for one year. Secondly, we followed this cohort for three years and obtained clinical features of the episodes during this time.

The following was an observational, retrospective, single-center study. We recruited patients with bronchospasm/wheezing who attended the pediatric emergency department (PED) of the Hospital Universitario La Paz (Madrid, Spain) during 2015 (January 1 – December 31). After an informatic 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 patient’s visits to the PED during the next three years (2015-2018). Clinical and demographic data obtained on each visit was collected from the pediatric emergency department informatics system and the hospital medical records. The hospital Universitario La Paz Ethics Committee approved this study in its first version, code HULP: PI-2347.

Descriptive statistics, including mean and interquartile ranges for continues variables and frequency and percentage for categorical variables were provided to describe the study population. SPSS package was used for analysis. For intergroup comparisons, ANOVA was used. Statistical significance was determined by $p < 0.05$.

From 2609 patients registered during 2015 under bronchospasm/wheezing/asthma exacerbation, 129 patients had 3 or more ED admissions. Children included were between 0 and 13 years old (mean age: 2.58; standard deviation (SD); 2.43). The distribution of episodes per patient was as follows: 72/129 (55.8%) had 3-4 episodes; 54/129 (41.9%) had between 5-6 episodes, and 3/129 (2.3%) had 7-8 episodes. The distribution by gender 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 in 2018.

Triggers per visit were registered 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 figure 1. Episodes that required hospital admission were as follows in 2015: 103/377 (27%); in 2016: 40/176 (22%); in 2017 10/97 (10%) and in 2018: 16/41 (39%). Episodes requiring admission in the intensive care unit (ICU) decreased from 14 admissions in 2015 to 0 admissions in the 2018 (during 2016 and 2017: 2 episodes required ICU admission each year). The majority of episodes that required ICU admission, were registered during March in 2015, followed by November and October of the same year (Figure 1).

Of the studied patients, 31 (24%) were referred or under an allergist care. 46.8% of these 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 LTP/profilin 3 (9.6%). Of the patients sensitized to pollen, 55.6% were sensitized to two or more pollens at the moment of assessment. More than 50% of patients sensitized to animal dander were sensitized to both cats and dogs.

The asthma diagnosis in children younger than 5 years is challenging.[3] The global initiative for asthma (GINA) in its latest edition, proposes a scale of probability of asthma to be applied in these patients. In this sense, children with more than 3 episodes/year, severe episodes, nocturnal worsening, or with respiratory symptoms for more than 10 days after a respiratory infection are more likely to have asthma than those who do not match these criteria.[3]

Even though lung development starts in early gestation, it continues through childhood.[4]

Therefore, in children, the lung is susceptible to factors that might affect its correct growth.[5]

An *asthma exacerbation* is defined as the increase of inflammation in the airway that limits the airflow and triggers asthma symptoms.[5,6] These episodes increment emergency department visits, hospital admissions and reduce the patient's quality of life.[7]

There was no statistical difference regarding gender distribution of our sample. Having said this, the percentage of males was higher than females. This was expected considering published data where males tend to wheeze and develop asthma more frequently than females until the age of 16. [2]

We recognize a pattern of prevalence of infectious diseases as triggers of the majority of episodes in our sample, which is also in line with previous published information.[8,9] Even though PED doctors could consider epidemiological characteristics of the sample like age, month of PED admission, contact with infectious cases or nursery attendance, to predict a respiratory infection, a microbiological confirmation should be performed to determine causality.

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

One of the hypotheses that tries to explain the persistence of wheeze in children relates activation of inflammatory paths secondary to infections and aeroallergen exposure that affect the normal development of the airway. [10] In this sense, airway modifications can trigger phenotypical changes that can make the child prone to wheeze persistence.[11] There is an individual risk to develop persistent wheeze and asthma, but it is affected by early respiratory infections in the first year of life and allergic sensitizations.[12]

Persistent wheezers are outstandingly more susceptible to have allergic triggers for asthma.[2] Keeping 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 that registers more than 3 episodes of PED attendance due to bronchospasms in one year. It is important to follow these patients and to determine possible causes that might conduct to treatment failure and more asthma exacerbations.

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Figure 1. Annual distribution of bronchospasm episodes that attended the PED from 2015 to 2018.

