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ORIGINAL ARTICLE

Mould and grass pollen allergy as risk factors for childhood asthma in Zaragoza, Spain



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Abstract

Objective: Examine the prevalence of asthma and associated predictive factors in a group of 468 students.

Patients and methods: A descriptive, cross-sectional observational study in a randomly selected population of 468 children aged 10–12, in the city of Zaragoza. We used the ISAAC questionnaire on asthma completed by children under supervision of the investigators. We assessed the genetic risk (family history of asthma) and environmental risks. The risk for atopy was assessed by the presence of positive skin prick tests.

Results: 25.3% of the children had symptoms consistent with asthma in the city of Zaragoza. Among them 33.1% reported a history of asthma in close relatives (OR = 1.78, $p < 0.001$). The history of hospitalisations for lower respiratory tract illness was strongly associated with the presence of asthma (OR = 6.72, $p < 0.0001$). Positive skin tests to *Alternaria* (OR = 2.00, $p < 0.0001$) and grass pollen (OR = 1.76, $p < 0.001$) were predictors of asthma. 63.6% of asthmatic children had presented clinical rhinitis in the previous 12 months, compared with 32% of non-asthmatics, and this difference was statistically significant (OR = 3.89, $p < 0.0001$). 47% of asthmatics presented with or previously had eczema, whereas only 26.9% of non-asthmatics presented with or previously had these types of lesions ($p < 0.0001$).

Conclusion: The following are predictors of asthma: History of hospital admissions for lower respiratory tract illness, presence of rhinitis and/or eczema, positive prick test for certain aeroallergens, especially *Alternaria* and grass pollen, and family history of asthma.

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Introduction

Asthma is a multifactorial disease with a high prevalence in childhood. It involves a significant degree of morbidity, loss of quality of life for the child and parents and great cost, direct and indirect, to the family and Health Administration.^{1,2} In Spain, following the epidemiological questionnaire of the International Study of Asthma and Allergy in Children (ISAAC),³ the prevalence of childhood asthma was studied in Huesca,⁴ Castellón⁵ and all participating areas.⁶ The later study included 42,417 Spanish children in phase I (1994–1995), and 42,813 in phase III (2002–2003). The prevalence of asthma in children aged 6–7 years, reported by parents, was 7% and 10.7% for boys in phases I and III and 5.3% and 8.2% for girls in phases I and III, respectively. The self-reported prevalence of asthma in adolescents aged 13–14 years was 9% and 9.3% in boys, in phases I and III, and 9.6% and 9.2% in girls in phases I and III, respectively. However, the results on the prevalence of asthma in many Western countries, even within the same country, are not always comparable, given the geographical, cultural and socioeconomic differences that produce wide variations in the frequency of this disease, nationally and internationally. These differences⁷ would probably be due to environmental factors (level of hygiene, allergenic pressure, infections, overuse of antibiotics and other unknown factors).

Following the same ISAAC epidemiological questionnaire, the aim of this study was to estimate the prevalence of asthma and its associated predictors in a school population of the city of Zaragoza, Spain. It is named the LAPIZ study (*Estudio epidemiológico de Asma en Población Infantil de Zaragoza* [Epidemiological Study of Asthma in the Juvenile Population of Zaragoza]).

Patients and methods

The design was a descriptive, cross-sectional, observational study of a representative population of 468 children aged 10–12 years in the city of Zaragoza. The study was approved by the local health authority (Instituto Aragonés de Ciencias de la Salud – IACS) and its Ethics Committee. Children of this age were chosen for their comprehension and ability to self-complete the questionnaire, which is not possible for younger children, and for being the oldest group that had afternoon classes once our business hours were over. In the random sampling 14 schools were included, public or semi-private, and one private.

The required sample size calculation was 457 children, making a rough estimate of the population group of 10–12 years of 11,219 people (based on official figures from the current census during the design of the study that showed 28,047 children aged 10–14 years), for a confidence level of 95%, accuracy of 2% and prevalence of childhood asthma of 5%. The sample represented different areas of the city and took place during the autumn and winter months of the 2007–2008 school academic year. We excluded spring and summer because hypersensitivity to grass pollen, olive and *Chenopodiaceae*, which pollinate during those months, is the most relevant in our geographic area. We thus avoided children receiving symptomatic treatment at the time of the

study, which could bias the results. The study only included children whose parents had signed the informed consent. Non-participants were sent an anonymous and voluntary survey asking why they had decided not to participate: forgetfulness; being already diagnosed with asthma and/or allergy; the child does not have any health problems; the child did not want to participate; the parents have not received the informed consent to sign; other causes.

At the outset, the children self-completed the validated ISAAC questionnaire⁸ for asthma and allergy under the investigators' supervision. We chose this questionnaire for validation due to its great relevance worldwide. Self-completion yielded two groups: those who had no symptoms suggestive of asthma and those who, in the last 12 months, had experienced asthmatic symptoms and/or had been diagnosed with asthma. Risk factors for asthma assessed in the questionnaire⁹ were genetic risk (family history of asthma) and environmental risk (exposure to tobacco smoke, domestic animals and relevant respiratory illness). The risk for atopy was assessed by testing the presence of immediate hypersensitivity through skin prick test to one of the most significant environmental aeroallergens in our environment (Bial-Arístegui, Bilbao, Spain), including *Phleum pratense*, *Olea europaea*, *Salsola kali*, *Parietaria judaica*, *Platanus acerifolia*, *Cupressus sempervirens*, *Dermatophagoides* spp., *Alternaria alternata* and dog and cat dander. Histamine hydrochloride (10 mg/mL) and glycerol saline served as positive and negative controls respectively. A skin test was considered positive when its wheal diameter was larger ≥ 3 mm than the negative control.

Statistical analysis

SPSS (version 15) was used to conduct the statistical analysis. Quantitative variables were expressed by their mean and standard deviation and qualitative variables as proportions. Relationships between paired variables were analysed using contingency tables and Pearson contrasts χ^2 for qualitative variables. In the case of a qualitative and quantitative variable, relationships were analysed by Student *t*-test for comparison of means. Finally, multivariate logistic regression was used to identify factors predicting asthma.

Results

Of an initial sample of 848 children, 468 participated in our study, representing 55%. The demographic characteristics of non-participants did not differ from the sample: the schools and homes of the children were in the same metropolitan area with similar air pollution and they were studying the same academic year. The anonymous and voluntary survey sent to non-participants was returned by 211 parents (55.53%) and the reasons given were: forgetfulness 6.16% ($n = 13$); being already diagnosed with asthma and/or allergy 12.79% ($n = 27$); the child does not have any health problems 33.17% ($n = 70$); the child did not want to participate 18% ($n = 38$); the parents have not received the informed consent to sign 2.84% ($n = 6$), and other causes 27.01% ($n = 57$). Table 1 shows the general characteristics of the study population. According to the results of the ISAAC questionnaire, 118 of 466 children had symptoms consistent with asthma,

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