

# Risk factors associated to the prevalence of asthma in adolescence\*

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## ABSTRACT

The ISAAC project (International Study of Asthma and Allergies in Childhood) was developed with the purpose of determining the prevalence of asthma in school children, with the definition of two age groups: infancy, when asthma is more frequent, and adolescence, when mortality associated to asthma is greater. However, the study does not address the risk factors associated with this pathology.

Our aim is to comparatively analyze the prevalence of respiratory symptoms and the asthma epidemiological factors in the two age groups and in both sexes. Since the results of ISAAC Phase I are available, we can study the variations in risk factors, relating them to the current prevalence of asthma.

The prevalence of bronchial asthma in our adolescents is 10 % – this implying a significant increase with respect to the data corresponding to ISAAC Phase I. Likewise, the prevalence of wheezing in the last 12 months has also increased significantly with respect to the data corresponding to ISAAC Phase I.

It can be affirmed that familial antecedents of asthma are significantly correlated to the fact of hav-

ing experienced asthma at some point in time, or to wheezing in the previous 12 months. In the same way as for bronchial asthma, the increase in rhinitis has been significant.

The presence of animals in the home is significantly associated to the fact of having experienced asthma at some point in time, though the presence of animals in the home has decreased significantly.

An encouraging finding in our study is the fact that smoking has decreased significantly among adolescents in comparison with the previous data. However, the same does not apply to smoking among parents, which shows results similar to those recorded in the previous study – with an influence upon the same habit in the offspring. As in other studies, active smoker status is seen to be associated with the fact of having experienced asthma at some point in time.

Although a common observation, the importance of hyper-responsiveness with exercise among adolescents is still not acknowledged, despite its significant correlation to the fact of having experienced asthma at some point in time, or wheezing in the previous 12 months.

**Key words:** Asthma. Prevalence. Adolescence. ISAAC. Risk. Diet. Domestic pets. Smoking. Atopy. Respiratory infection. Virus. Rhinitis.

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The ISAAC project (International Study of Asthma and Allergies in Childhood) was developed with the purpose of determining the prevalence of asthma in school children, with the definition of two age groups: childhood (between 5-8 years), when asthma is more frequent, and adolescence, when mortality associated to asthma is greater. However, while the

ISAAC studies the prevalence of asthma, it does not address the risk factors associated with this pathology.

In ISAAC Phase I (1994-1995), we included an additional questionnaire with the risk factors associated to bronchial asthma contemplated in the Global Strategy for Asthma Management and Prevention (GINA)<sup>1</sup>; following the methodology of the ISAAC<sup>2</sup>, we evaluated children between 5-8 years of age, and adolescents in the 11-16 years age interval. At present we analyze the results of ISAAC Phase III (2000-2001), where again we have included an additional questionnaire, modified with respect to the questionnaire in Phase I, and targeted to the same age groups.

Our aim is to comparatively analyze the prevalence of respiratory symptoms and the asthma epidemiological factors in the two age groups and in both sexes. In this way we can determine which risk factors the children presenting wheezing in the past 12 months or asthma at some point in time have been exposed. On the other hand, since the results of ISAAC Phase I are available, we can study the variations in risk factors, relating them to the current prevalence of asthma.

The present study describes the results obtained in the group of adolescents.

## RESULTS

A written questionnaire with questions relating to bronchial asthma risk factors was used to study 4644 adolescents with an age of between 11-16 years (2435 boys and 2209 girls). Ten percent of the adolescents had experienced asthma at some point in time, and 7.1 % had suffered wheezing in the previous 12 months. In the Phase I study, the prevalence of asthma at some point in time for this same age group was 8.7 %, while the prevalence of wheezing in the past 12 months was 5.5 % – the differences between the two studies being significant ( $p = 0.0466$  and  $p = 0.0035$ , respectively).

On examining *family antecedents of asthma* as a predisposing factor in the global individuals of this age group, the prevalence was seen to be 7.3 %, versus 19.6 % in the first study – no significant differences being observed between boys and girls. In the subgroup of adolescents that had suffered asthma at some point in time, the prevalence of such antecedents was 16.8 %, with an odds ratio (OR) of 3.03 ( $p < 0.001$ ). Compared with the results of the previous study, in which the prevalence of asthma at some point in time was 42.5 %, OR 4.3 ( $p < 0.0001$ ), the difference in the percentage of adolescents with

family antecedents of asthma is notorious. Similar results are obtained on considering the adolescents with wheezing in the previous 12 months – 19.6 % of which had antecedents, OR 2.84 ( $p < 0.001$ ), versus 35.6 % in the first study.

On examining the *existence of rhinitis* as a predisposing factor, 68.3 % of the total adolescents were seen to present associated rhinitis. Of the children with bronchial asthma at some point in time, 76.4 %, OR 1.97 ( $p < 0.001$ ), had associated rhinitis. Of note is the increase in prevalence of children with symptoms of this kind compared with the first study, where rhinitis was recorded in 44.5 % of the children with asthma at some point in time. Very similar results are obtained on considering the adolescents with wheezing in the previous 12 months: 80.7 %, OR 3.36 ( $p < 0.001$ ), versus 53.6 % in the first study.

In relation to sex, 12.1 % of the males had experienced asthma at some time, versus 8.2 % of the females ( $p = 0.09$ ). In Phase I these percentages were 10.7 % and 6.5 %, respectively – with significant differences this time between boys and girls ( $p < 0.0001$ ). As regards wheezing prevalence in the previous 12 months (7.1 %), the distribution by sex was 7.2 % among boys and 6.9 % in girls ( $p < 0.9$ ); the first study likewise showed a male predominance in this sense ( $p < 0.038$ ).

We have examined the repercussion of the presence of *animals in the home* as a causal and triggering factor, and its association to the fact of having experienced asthma at some point in time, or wheezing in the previous 12 months. Of the total adolescents studied, 24.8 % had animals in the home, compared with 30.9 % in Phase I ( $p = 0.00$ ). In the present study, the presence of animals showed a significant correlation to the fact of having experienced asthma at some point in time, OR 1.46 ( $p = 0.001$ ), though not to wheezing in the previous 12 months. In the first study, the fact of having experienced asthma at some point in time, or wheezing in the previous 12 months, was not associated to the presence of animals in the home. In Phase III of the study, we expanded the questionnaire with some questions in this sense. A full 95.4 % of the children suffered worsening of their asthma symptoms in the presence of animals, though few physicians had counterindicated pets in the home (cats in 6.3 % of cases and dogs in 5 %). In the case of the adolescents with asthma at some point in time, domestic pets were contraindicated in 32.2 % of cases, versus in 4.3 % among those that had not suffered asthma at some time ( $p = 0.000$ ). Regarding those who had experienced wheezing in the previous 12 months, domestic pets were contraindicated in 27.6 % of cases, versus in 10 % among those that had not suf-

ferred wheezing – the difference in this case also being statistically significant.

Among the contributing or triggering factor, mention must be made of *respiratory infections*. On questioning about the presence of fever in the context of bronchitis, the adolescents with asthma at some point in time and wheezing in the previous 12 months showed a significant association in both cases, OR 3.10 ( $p < 0.001$ ) – these data being similar to those of the first study, OR 3.27 ( $p < 0.001$ ).

Another contributing factor contemplated in the GINA is *diet*. As in the first study, though specifying more in detail whether the physician had contraindicated some dietary component, we found 7.9 % of all the adolescents to have been instructed to avoid some type of food. On selecting the adolescents that had experienced asthma at some point in time, the physician had indicated the avoidance of some type of food in 13.4 % of cases, OR 2 ( $p = 0.000$ ), versus in 7.2 % among those who had not suffered asthma – the difference being significant ( $p = 0.000$ ). Among the subjects who had experienced wheezing at some point, such avoidance was indicated in 12.6 % – this percentage being similar to that recorded among the adolescents without wheezing in the previous 12 months, OR 1.04 ( $p = 0.872$ ).

In relation to *smoking*, and on examining passive smoker status, we found that smoking in the home was reported by 66.5 % of the adolescents who experienced asthma at some point in time, OR 0.83 ( $p = 0.074$ ), and by 69 % of those who had experienced wheezing in the previous 12 months – likewise no significant association being observed in this case. Among the adolescents, 5.6 % were regular smokers, versus 12.4 % in the first study ( $p < 0.004$ ). Specifically, 4.2 % smoked 1-10 cigarettes a day, while 0.8 % smoked over 10 cigarettes a day. Smoking among the adolescents was significantly associated to the fact of having experienced asthma at some point in time, OR 1.75 ( $p < 0.001$ ), but not to wheezing in the previous 12 months, OR 1.466 ( $p < 0.099$ ). On attempting to relate parent smoking to smoking among the adolescents, we found that 60.7 % of the parents of smoking adolescents were also smokers, while 39.3 % were non-smokers. In turn, 53.1 % of the parents of non-smoking adolescents were active smokers.

Among the triggering factors, we explored *dry cough* and *wheezing with exercise* in the previous 12 months. This was one of the items most closely related to the diagnosis of asthma in the validation of the questionnaire<sup>3</sup>; specifically, 26.9 % of the adolescents reported these symptoms, versus 31.9 % in Phase I ( $p = 0.00$ ). On considering the adolescents that had suffered asthma at some point in time,

50.5 % presented dry cough with exercise, OR 3.20 % ( $p < 0.001$ ). These findings are similar to those obtained in Phase I – no significant differences being observed between them. Among the adolescents that had experienced wheezing in the previous 12 months, 59.7 % suffered cough with exercise, OR 3.48 ( $p < 0.001$ ). Wheezing with exercise in the previous 12 months was significantly associated to adolescents that had suffered asthma at some point in time, or wheezing in the preceding 12 months, OR 3.34 ( $p < 0.001$ ), OR 5.29 ( $p < 0.000$ ), respectively.

## DISCUSSION

The prevalence of bronchial asthma in our adolescents is 10 % – this implying a significant increase with respect to the data corresponding to ISAAC Phase I. Likewise, the prevalence of wheezing in the last 12 months has also increased significantly with respect to the data corresponding to ISAAC Phase I<sup>4</sup>. Our observations coincide with those of other authors such as Maziak<sup>5</sup>, who in Germany reported an increase in the prevalence of asthma and allergic diseases in the two age groups considered in the ISAAC. Comparative studies versus the data of the ISAAC, conducted by García-Marcos<sup>6</sup>, reveal a significant increase in the prevalence of wheezing in the past 12 months, and in the diagnosis of asthma at some point in time – though in this case the increase proved significant in girls but not in boys.

Of note in our observations is the results of the study of family antecedents of asthma, taking into account that the question format was similar to that used in the questionnaire employed in the first study. In effect, it can be affirmed that familial antecedents of asthma continue to be significantly correlated to the fact of having experienced asthma at some point in time, or to wheezing in the previous 12 months. However, in the current study, the adolescents report family antecedents of asthma less often than in the previous survey. This could be explained by an increased lack of awareness among the adolescents; by current social problems associated with immigration, separation, etc.; or by improved asthma control in the adult.

In the same way as for bronchial asthma, the increase in rhinitis has been significant<sup>7</sup>; this is probably attributable to increased interest in diagnosing the condition, in view of its relationship to bronchial asthma. A highly significant association is observed among adolescents that have experienced asthma at some point in time or wheezing in the previous 12 months.

As to patient sex, our first study<sup>8</sup> identified the male sex as a risk factor for asthma at some point in time or wheezing in the previous 12 months. In the present study, and although males continued to predominate, the differences were not significant.

Regarding the presence of animals in the home, we have explored more in depth some questions that raised doubts in Phase I<sup>8,9</sup>. In addition to asking about the presence of domestic pets, which in the present study was significantly associated to the fact of having experienced asthma at some point in time, we also found the presence of animals in the home to have decreased significantly. In the first study, our major doubt was how many subjects with asthma or wheezing were forbidden by the physician to have animals at home (specifically cats and dogs as the most frequent pets). In effect, among the adolescents that had experienced asthma at some point in time, the physician contraindicated domestic pets in 32.2 % of cases, versus in 4.3 % of cases among those without asthma, and in only 10 % of those with wheezing in the previous 12 months. Although further studies are needed, the current literature reports that early contact with pets prevents the risk of developing asthma, but also contributes to the persistence of symptoms among those who already have asthma. This coincides with our own observations, since 95 % of the asthmatic adolescents worsened of their symptoms in such situations.

Regarding diet<sup>10</sup>, the literature relates obesity, body mass index (BMI), etc., to a lack of exercise and susceptibility to asthma. We have tended to identify a history of food allergy as a risk factor. Probably, on analyzing the data related to other allergic disorders such as atopic eczema, it will be possible to draw firmer conclusions regarding its association to asthma or to wheezing in the previous 12 months. However, we advise the study of possible food sensitization in children with bronchial asthma, in view of the observed association between both conditions.

Smoking in adolescents has been examined as a risk factor for bronchial asthma, in the same way as passive smoker status due to the presence of smokers in the home. For years, many studies in the literature have focused on the problem of smoking in the general population. An encouraging finding in our study is the fact that smoking has decreased signifi-

cantly among adolescents in comparison with the previous data. However, the same does not apply to smoking among parents, which shows results similar to those recorded in the previous study – with an influence upon the same habit in the offspring. As in other studies, active smoker status is seen to be associated with the fact of having experienced asthma at some point in time.

Although a common observation in clinical practice, the importance of hyper-responsiveness with exercise among adolescents is still not acknowledged, despite its significant correlation to the fact of having experienced asthma at some point in time, or wheezing in the previous 12 months.

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