



# Epidemiology of asthma in schoolchildren in Portuguese speaking regions

## Épidémiologie de l'asthme dans les pays lusophones

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### Abstract

Asthma in schoolchildren became a priority both for developing and developed countries. Two large multi-centre epidemiological studies (Portuguese Study of Allergic Diseases in Childhood and the International Study of Asthma and Allergies in Childhood) were implemented in the last decade. One of the main objectives was to compare prevalence of asthma and evaluate cultural, ethnic and environmental variables in schoolchildren of different continents. These studies can contribute to a global strategy (with national specificity's) including self management programs in the control of asthma to reduce the morbidity and mortality, and promote better quality of life with better allocation of resources.

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### Résumé

L'asthme chez l'enfant d'âge scolaire est devenu une priorité pour les pays en voie de développement ainsi que dans les pays développés. Deux grandes études épidémiologiques multicentriques (étude portugaise des maladies allergiques de l'enfance et ISAAC) ont été menées durant la dernière décennie. Un des objectifs principaux a été de comparer la prévalence de l'asthme et d'évaluer les différents facteurs culturels, ethniques et environnementaux chez les enfants d'âge scolaire des différents continents. Ces études peuvent contribuer à établir une stratégie globale tenant compte des spécificités nationales et aboutissant à des programmes d'auto-gestion consacrés au contrôle de l'asthme. Le but est de diminuer la morbidité et la mortalité et d'améliorer la qualité de vie grâce à une meilleure distribution des ressources.

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## 1. Introduction

Bronchial asthma constitutes an important health problem worldwide related with significant impact in terms of morbidity and mortality, being with allergic rhinitis, the most frequent childhood chronic diseases, showing also a prevalence increase in developed and developing countries [1–3].

In 1992 two different epidemiological studies under the responsibility of our group started in the Portuguese speaking regions of Portugal (Europe), Cape Verde (Africa) and Macao (Asia): the global ISAAC study (*International Study*

*of Asthma and Allergies in Childhood*) and the Portuguese Epidemiological study of Childhood Allergic Diseases. In these two studies, involving a large group of investigators, performed during 10 years, we analysed epidemiological data collected from Portuguese official language regions with different genetic, cultural and environmental influences.

## 2. The Portuguese study of allergic diseases in childhood

This study was performed by the coordination of Mário Morais Almeida (MD) in different official speaking Portuguese regions [4,5], with two main purposes: a) to access atopy

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and allergic diseases prevalence in randomly samples of schoolchildren; b) to obtain baseline measure for future comparisons. The same methodology was applied in all the different populations studied; 1) standard questionnaire (based on EC and ATS questionnaires) ; 2) skin prick tests (standardised allergen extracts to common inhalant allergens: house dust mites, cockroaches, moulds, pets and pollens, supplied by Merck-Allergopharma and CBF-Leti); 3) bronchial provocation test with methacoline (Lofarma) for the characterisation of bronchial hyperactivity performed among those who had asthma symptoms in the last year according to questionnaire.

In 1993, 235 black race children for Sal island aged 6–16 years were studied; in 1994 a sample of 588 children aged 6–10 years was included in S. Vicente island the majority of them crioules (this two island belong from the archipelago of Cape Verde, an African country in the Gulf of Guinea). In 1995, 1061 Caucasian children aged 6–10 years were studied in Madeira Island (Portuguese island located in the Atlantic Ocean nearby Morocco). In 1997, 1385 Chinese children aged 6–12, were studied in Macao (a territory located on the Southern Coast of China, under Portuguese administration until December 1999). In each of these three regions the population is around 400,000 inhabitants, and the method used were a investigator applied standard questionnaire and a battery of skin prick tests; in the children with recurrent wheezing in the last year and in age matched control, a methacoline challenge test was performed. Atopy was defined as at least one positive skin prick test (wheal greater than  $7 \text{ mm}^2$ ), and positive bronchial hyperactivity was found when a PD20 FEV<sub>1</sub>, methacoline lower than  $7.8 \mu\text{mol}$  was found. Active asthma identified those children with symptoms on the last year and current asthma was considered when it was found a positive bronchial test in children with active asthma.

The results from Cape Verde and Madeira presented a significant difference of atopy in the population: from 6 and 11, 9% in Sal and S. Vicente islands to 54% in Madeira, and active asthma between 7% in S. Vicente and 14, 6% in Madeira. In Macao we found a significant prevalence of atopy (46%) with a large percentage of children with multiple sensitisations. In the three regions, house dust mites were the predominant allergens. According to the atopy status of the population, low prevalence of active asthma (1, 3%) and ever asthma (3, 5%) was not expected. Most asthmatic children had atopy (86%) in Macao and had a positive methacoline challenge test (88%). This low asthma prevalence seems near the data published referring the rural area of China.

In 1999 in Sal Island (Cape Verde) it was random a new sample of 175 children aged 6–10 years to correlate with the same age group of 180 students, studied 6 years earlier. The atopy prevalence raised threefold (6–18%). The prevalence of active asthma was unchanged (15–16%) but the percentage of atopic asthma increased from 2% to 5%. That is probably the progress price due of this small island (7000 inhabitants) with the increasing of the tourism industry and the improving of better standing of life of the local population during this period.

### 3. The ISAAC study

This study was performed under the national coordination of J. Rosado Pinto (MD) [6,7] by questionnaire modules in Portugal between 1993 and 2003 involving more than 40,000 schoolchildren of two age group 6/7 and 13/14 years old. The objectives of this study, not yet completely published and divided in three phases were: 1) to describe the prevalence and severity of allergic diseases in children living in different places, allowing comparison within and between countries; 2) to obtain baseline measures for the assessment of future trends in allergic diseases prevalence and severity; 3) to provide a framework for further etiological research into lifestyle, environmental, genetic and health care/action affecting these disease; 4) to examine time trends in the prevalence of asthma, allergic rhinoconjunctivitis and atopic eczema in centres and countries which participated in Phase I, several years ago. This study involved in Phase I (1993/1994) 207 school for 6/7 years old and 84 for 13/14 years old and 408 and 142, respectively, for the some age groups, in 2002/2003. When we compare the data of “wheezing last year” in the group of 6/7 years, 8 years later we found the same prevalence 12.9%, but in the 13/14 years an statistically significant increasing from 9.2% to 11.8%, particularly in the two main populated areas of the country: Porto (+5.9%) and Lisboa (+3.7%). The same trend was found, in the group 13/14 years, in the “cumulative prevalence of asthma” diagnosed by doctor: from 11.8% to 14.7% [8].

In Phase II, performed in 2000 when we compare with Phase I (1993) the severity of wheezing (> 12 attacks per year), we found an increasing of 43%. The most important risk factors for asthma exacerbations, in Phase II, were the respiratory infections, house dust and tobacco smoke exposure.

During the Phase II study it was also performed a multi-centre study of NO<sub>2</sub> [9] involving seven countries (Portugal, Spain, Germany, Austria, Sweden, Finland and Estonia) supported by EU Biomed 2 funds. The concentration of the NO<sub>2</sub> outdoor pollution is related with the car traffic concentration. The median rate level of NO<sub>2</sub> found in the three Portuguese centres (Lisboa, Portimão and Funchal) was  $17.5 \mu\text{g}/\text{m}^3$  with the highest values in Funchal (Madeira):  $22, 5 \mu\text{g}/\text{m}^3$ . Analysing the concentration of NO<sub>2</sub> in Lisbon area during 1 year we found the highest values in autumn and winter time in a place where the car traffic was very important.

The advantage of the ISAAC study is the possibility to compare centres and countries with the same methodology. When we compare the Phase I and III results from Portugal and Brazil (national coordinator: Professor Dirceu Solé) in the same centres the item “ever wheezing” and “wheezing last year”, the results were: Portugal 18.2–21.8% and 9.2–11.8%; Brazil 43.0–39.8% and 21.1–17.4%. In the largest populated areas in each countries, Lisboa and São Paulo, in “wheezing last year” (10.9% and 15% versus 23.3%, and 24.4%) the difference of prevalence was decreased in the last survey (12% to %).

In the ISAAC Phase III the questionnaire included several “style of life” items. The most relevant results at national level referred in the 13/14 years age group were: fast food/hamburger once a week—40.5%; physical activities three or more times a week—22.5%; 3 or more h/day watching TV—31.3%; no smoker at home—34.7%; close contact with a dog during last year—49.3%.

#### 4. Discussion

In this studies, the significant variation of asthma prevalence found in the paediatric population studied, remain in discussion, but although genetics linked to race, seems to play a role, it will be strongly modulated by the environmental variables and lifestyle.

The results found in Cape Verde, namely the differences of atopy between the two islands studied with important ethnic variation (Sal-predominantly blacks; S. Vicente-crioulos) point out the importance of genetics. The low prevalence of atopy in this country was not related with absent exposition. Recurrent respiratory infection and parasitosis may play a role modulating the allergic response. In Macao a low prevalence of asthma was found, similar to the values described to China, sharing the same ethnic background, but much more lower than in Hong Kong [10]. In contrast, atopic sensitisation was identical to China, Hong Kong and also Madeira. In addition to atopy other risk factors as “western lifestyle” seems important on allergic disease in Africa and Asia regions [11,12].

In what concerns Brazil and Portugal and the correlative increasing of asthma prevalence in the Portuguese schoolchildren, it can be related to the complete change in the style of life “into indoor habits” of the Portuguese during the last 10 years (TV, computer, ...) [13].

#### 5. Conclusions

The increasing of asthma and allergic diseases in the last decades in all continents demands for a global strategy [14–16]. The large epidemiological studies in different areas of the world stress the importance of genetics, linked to race in the pathogenesis of asthma, modulated by environmental and lifestyle variables. As consequence of these projects, it is

possible to plan health care programs at national and international levels for better prevention, education and treatment of our populations.

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