

ORIGINAL ARTICLES

Prevalence of rhinitis and related-symptoms in schoolchildren from different cities in Brazil

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ABSTRACT

By using the standard written questionnaire (WQ), designed for the International Study of Asthma and Allergies in Childhood (ISAAC) we determined the prevalence of rhinitis and its related-symptoms, in Brazilian children and adolescents, living in different cities of the country. The WQ was answered by the parents of 11,403 children aged 6-7 years from five Brazilian cities: Porto Alegre (South, N = 2,846), São Paulo (Southeast, N = 3,005) Uberlândia (Southeast, N = 2,991), Itabira (Southeast, N = 1,151) and Recife (Northeast, N = 1,410). The WQ was also applied to 20,587 adolescents (13-14 years old) living in: Porto Alegre (South, N = 3,195), Curitiba (South, N = 3,004), São Paulo (Southeast, N = 3,008), Uberlândia (Southeast, N = 2,998), Itabira (Southeast, N = 2,134), Salvador (Northeast, N = 3,162) and Recife (Northeast, N = 3,086). The mean response rates were 75% and 95%, for the 6-7 year-old children and for the adolescents, respectively. The data was transcribed to a database (Epi-Info) and analyzed regarding the answers to questions of rhinitis module. The mean prevalence of rhinitis (affirmative response to question 2) was 26.6% and 34.2% in the groups of

6-7 and 13-14 year-old, respectively. Applying the criteria that evaluate the association between nasal and ocular symptoms (affirmative response to question 3) the mean prevalence of allergic rhinitis were 12.8% for the 6-7 year-old children and 18.0% for the adolescents. In conclusion, the prevalence of rhinitis and its related symptoms among children and adolescents living in different Brazilian cities was as high as the prevalence observed in other areas of the world.

Key words: Rhinitis. Prevalence. ISAAC. Epidemiology. Written questionnaire. Children.

RESUMEN

La prevalencia de rinitis y de sus síntomas en niños y adolescentes brasileños, que viven en diferentes ciudades, fue determinada por el cuestionario escrito (CE), desarrollado por el International Study of Asthma and Allergies in Children (ISAAC). El CE fue respondido por los padres de 11.403 niños con edad entre los 6-7 años, en cinco ciudades brasileñas: Porto Alegre (Sur, N = 2.846), São Paulo (Sudeste, N = 3.005), Uberlândia (Sudeste, N = 2991), Itabira (Sudeste, N = 1.151) e Recife (Nordeste, N = 1.410). En la faja de edad de 13-14 años el CE fue respondido por 20.587 adolescentes que vivían en: Porto Alegre (Sur, N = 3.195), Curitiba (Sur, N = 3.004), São Paulo (Sudeste, N = 3.008), Uberlândia (Sudeste, N = 2.998), Itabira (Sudeste, N = 2.134), Salvador (Nordeste, N = 3.162) e Recife (Nordeste, N = 3.086). La tasa media de respuestas fue un 75 % para los niños menores y un 95 % para los adolescentes. Los datos fueron transcritos a una base de datos

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(Epi-info) y el análisis estadístico fue sobre el módulo rinitis del CE ISAAC. La prevalencia media de rinitis (sí a la pregunta 2) fue 26,6 % y 34,2 % en los grupos de 6-7 y 13-14 años respectivamente. Utilizándose el criterio que evalúa la asociación entre síntomas nasales y oculares (sí a la cuestión 3), la prevalencia media de rinitis alérgica fue de un 12,8 % para los niños de 6-7 años y de un 18,0 % para los adolescentes. En conclusión, la prevalencia de rinitis y síntomas relacionados en niños y adolescentes que viven en diferentes ciudades brasileñas fue tan elevada como la que se ha observado en otras partes del mundo.

Palabras clave: Rinitis. Prevalencia. ISAAC. Epidemiología. Cuestionario escrito. Niños.

INTRODUCTION

Epidemiologic studies have documented an increase in the prevalence of rhinitis, similarly to asthma, in different areas of the world. In Switzerland, the prevalence of seasonal allergic rhinitis has increased from 0.82 % in 1926 to 11.1 % in 1991¹. In the UK, there was an increase in the annual prevalence of seasonal allergic rhinitis from 12 % in 1958 to 23.3 % in 1970². Similar data have been reported by other authors³⁻⁸. However, lack of standardization on patient identification has hampered comparisons among different populations over time⁹.

Rhinitis symptoms may occasionally occur in normal individuals, and the lack of a standardized and properly validated method for the identification of rhinitis may account for the scarcity of epidemiologic data available. From the epidemiologic point of view, there is no current universally accepted definition of rhinitis, and the distinction between a normal individual and an individual with the illness is based on clinical history. In general, clinical definition is focused on the identification of patients whose symptoms are severe enough to require medical attention¹⁰. On the other hand, epidemiologic definition relies on the nature and distribution of symptoms within a population, independent from seeking medical attention¹⁰.

The International Study of Asthma and Allergies in Childhood (ISAAC) was idealized to maximize the value of epidemiologic studies in asthma and allergic diseases, establishing a standardized method capable to facilitate international collaboration^{10,11}. ISAAC has standardized a written questionnaire (WQ) that made possible the study of allergic diseases among children of culturally distinct populations. This low-cost instrument is easily applied and has high sensitivity and specificity¹⁰. Originally written in English, it was

validated following its translation to Portuguese (Brazilian culture) in order to be applied to our people¹².

In Brazil, few rhinitis epidemiological studies have been done, by using different methods. That contributes to the lack of knowledge of the real dimension of rhinitis in different areas of the country.

In the present study, by using the ISAAC's self-response WQ we determined the prevalence of rhinitis and rhinitis-related symptoms among schoolchildren living in different Brazilian cities. We also compared the rates obtained, once two of the cities are coastal cities, two are mid cities and the others are state capitals.

PATIENTS AND METHODS

Seven centers from seven Brazilian cities participated in this study. They were: Porto Alegre and Curitiba localized in South area of the country; São Paulo, Uberlândia and Itabira in Southeast; Recife and Salvador in Northeast.

The schoolchildren were selected as standardized by ISAAC protocol¹⁰. The data of involved schools were obtained by the respective City Education Secretary. After the sample definition, ISAAC WQ was filled in by the parents or guardians of the 6-7 year-old children and by the adolescents themselves.

From the total 15,204 children aged 6-7 years initially selected, 11,403 participated in the study: Porto Alegre (N = 2,846), São Paulo (N = 3,005), Uberlândia (N = 2,991), Itabira (N = 1,151) and Recife (N = 1,410).

At the age of 13-14 years, from the total of 21,670 adolescents selected to participate 20,587 answered the WQ: Porto Alegre (N = 3,195), Curitiba (N = 3,004), São Paulo (N = 3,008), Uberlândia (N = 2,998), Itabira (N = 2,134), Salvador (N = 3,162) and Recife (N = 3,086).

The data obtained were transcribed to a database (Epi-Info) supplied by ISAAC's coordinators. The frequency of positive answers to each question of the rhinitis module was analyzed according to the age group. These data were analyzed by the Chi-square test and partition, and the level for rejection of the null hypothesis was 5 %¹³. The study was approved by the ethical committee of each participating center.

RESULTS

Mean response rates of 75 % and 95 % were obtained among children 6-7 years old and 13-14 years old, respectively. Approximately 51 % of the respon-

Table I

Affirmative responses (%) to the ISAAC's written questionnaire (rhinitis module) by 6-7 year-old school children, from different cities in Brazil

Question	City						Chi-square*
	Porto Alegre [a] (N = 2,846)	São Paulo [b] (N = 3,005)	Uberlândia [c] (N = 2991)	Itabira [d] (N = 1,151)	Recife [e] (N = 1,410)	Total (N = 11403)	
1. Sneezing, runny, blocked nose without a cold, ever	34.0	40.0	28.0	69.4	33.0	37.5	b > a,d > c,e
2. Sneezing, runny, blocked nose without a cold, past 12 months	28.1	33.8	20.2	26.5	22.8	26.6	b > a,d > c,e
3. Nasal symptoms without a cold, past 12 months, accompanied by itchy-watery eyes	10.6	13.0	9.8	28.9	10.3	12.8	d > b > a,c,e
5. Interference with daily activities	16.6	20.9	13.2	20.2	17.5	17.3	b > a,c > d,e
6. Rhinitis ever	26.0	28.8	13.2	9.3	11.3	19.9	b > a > c,d,e

*p < 0.05.

ders were female in both age groups. The frequencies of affirmative answers for each question of the ISAAC WQ (rhinitis module) are presented in tables I and II.

The prevalence of “nasal symptoms without a cold ever” for 6-7 year-old schoolchildren varied between 28.0 % in Uberlândia and 69.4 % in Itabira (ta-

ble I). Having had these “nasal symptoms in the last 12 months”, varied between 20.2 % in Uberlândia and 33.8 % in São Paulo. This one was significantly higher than observed in other cities (table I). The prevalence of “nasal symptoms occurring in the last year in association with itchy-watery eyes” ranged from 9.8 % in Uberlândia to 28.9 % in Itabira. In

Table II

Affirmative responses (%) to the ISAAC's written questionnaire (rhinitis module) in adolescents, from different cities in Brazil

Question	City								Chi-square*
	Porto Alegre [a] (N = 2,846)	Curitiba [b] (N = 3,004)	São Paulo [c] (N = 3,008)	Uberlândia [d] (N = 2998)	Itabira [e] (N = 2,134)	Salvador [g] (N = 3,162)	Recife [g] (N = 3,086)	Total (N = 20,587)	
1. Sneezing, runny, blocked nose without a cold, ever	53.4	40.8	45.3	48.2	66.9	58.2	35.0	49.0	e > f > a > d > c > b > g
2. Sneezing, runny, blocked nose without a cold, past 12 months	40.8	29.8	34.0	35.2	26.7	46.0	24.1	34.2	f > a > c,d > b > g > e
3. Nasal symptoms without a cold, past 12 months, accompanied by itchy-watery eyes	17.6	14.1	14.4	20.1	25.5	25.0	11.3	18.0	e,f > a,d > b,c,g
5. Interference with daily activities	24.2	17.6	20.5	22.5	18.8	15.1	16.5	19.3	a,d > c,e > b, f,g
6. Rhinitis ever	24.4	7.9	31.7	18.1	11.2	24.7	18.3	19.9	c > a,f > d,g > b,e

*p < 0.05.

Itabira it was significantly higher than the others cities (table I). The prevalence of “nasal symptoms that interfere with daily activities” varied between 13.2 % in Uberlândia and 20.9 % in São Paulo, where it was significantly higher than in other Brazilian cities (table I). The prevalence of “rhinitis ever” ranged from 9.3 % in Itabira and 28.8 % in São Paulo (table I).

Regarding adolescents, prevalence of “nasal symptoms without a cold ever” oscillated between 35.0 % in Recife and 66.9 % in Itabira, where it was significantly higher when compared to the others cities (table II). The prevalence of these “symptoms occurring in the last 12 months” varied from 24.1 % in Recife to 46.0 % in Salvador, and in this city the prevalence was significantly higher than in the other ones (table II). However, “nasal symptoms associated with itchy-watery eyes” were significantly higher in Itabira (25.5 %) and Salvador (25.0 %) when compared to the other centers (table II).

The occurrence of “nasal symptoms that were severe enough to interfere with daily activities” was more frequent in Porto Alegre (24.2 %) and Uberlândia (22.5 %) and varied from 15.1 % to 24.2 % (table II).

The prevalence of “rhinitis ever” was higher in São Paulo (31.7 %) (table II). For all questions the prevalence of affirmative responses were higher among adolescents (tables I and II).

In the cities from South and Southeast regions highest frequency of nasal symptoms was observed in the coldest months of the year (May to August). In the centers of Northeast region there weren't significant differences in the prevalence of nasal symptoms, according the months (data not shown).

DISCUSSION

The ISAAC protocol was designed to evaluate the prevalence of asthma and allergic diseases in childhood, in different parts of the world, using a standardized method, to make the comparisons more reliable. The self-applicable ISAAC WQ is easy to understand and non-dependent of an interviewer, a frequent cause of error during the application of WQs¹⁰.

The ISAAC's WQ rhinitis module objectives are: 1) to identify individuals with and without rhinitis in the general population; 2) to predict, among individuals with rhinitis, those who are probably atopic and 3) to establish the degree of rhinitis severity among the population with rhinitis¹⁰.

The simultaneous presence of ocular and nasal symptoms, as investigated in question 3, presented the highest positive predicted value for detection of atopy among rhinitis patients (78 %). Question

4 allows separation of individuals with seasonal symptoms from those with perennial manifestations of the disease. The number of months the patient presents with symptoms can be used as a quantitative indicator of severity. Seasonal exacerbations have a positive predictive value of 71 % in detecting atopy among patients with rhinitis. Question 5 evaluates severity in a broad sense, and shows good correlation with other morbidity indicators: reported severity symptoms, interference with specific daily activities and use of medical care. Question 6 allows investigation of the medical diagnosis in relation to the symptoms of rhinitis. It has been demonstrated that questions 1 and 2 of the WQ have a high positive predictive value (80 %) for identifying patients with rhinitis among adults¹¹.

Brazil is a country with continental dimensions, whose total area of 8,5 million square kilometers is cut in North by the Ecuador and in Southeast by the Tropic of Capricorn. Its climate varies, according to the area. In the North, Northeast and Center-west areas, the climate is tropical with dry and lingering summer and rainy winter. In the Southeast and South areas climate is temperate, and seasons are better defined as we go to South.

Excepting Itabira and Uberlândia, all the Brazilian cities that participated in ISAAC phase-one study are state capitals, and two of them are coastal (Recife and Salvador). The population of each city is: 1.5 million in Recife, 2.2 million in Salvador, 0.44 million in Uberlândia, 9.8 million in São Paulo, 1.5 million in Curitiba, 1.3 million in Porto Alegre and 95 thousand in Itabira.

The identification of patients with rhinitis in epidemiologic studies is highly variable. The identification by the presence of rhinitis symptoms has been the approach most widely used when it is not possible to perform nasal smear cytology, rhinomanometry, nasal provocation, mucosal biopsy or to evaluate changes in the results of these procedures following medication use. In general, the presence of rhinitis symptoms in the 12 months prior to the application of the questionnaire has been thought to be more reliable, minimizing memory errors. In temperate regions, with well-defined seasons, it is recommended that the questionnaire should be applied out of the pollen season, to avoid interference with the responses to the questionnaire^{10,11,14}.

In the present study the mean prevalence of “nasal symptoms without respiratory infection ever” was 37.5 % and 49.0 %, among 6-7 and 13-14 years old groups, respectively. The preliminary analysis of ISAAC's phase-one data showed indexes that varied from 2 % to 50.4 % and from 4.2 % to 75.1 %, respectively.

The prevalence of “nasal symptoms without respiratory infection in the past 12 months” has been reported as 1.5 % to 41.8 %, and 3.2 % to 66.6 % among children 6-7 and 13-14 years old, respectively¹¹. We found a mean prevalence of 26.6 % and 34.2 % in the 6-7 and 13-14 years old groups, respectively. In São Paulo, where the atmospheric pollution is high, we observed among the 6-7 year-old schoolchildren the highest prevalence indexes of rhinitis and related symptoms occurring in the last year.

The prevalence of “nasal symptoms associated with ocular symptoms” has varied between 0.8 % and 14.9 %, and 1.4 % and 39.7 % for the 6-7 and 13-14 years old children, respectively¹¹. Among our children, we found mean prevalence of 12.8 % and 18.0 %, for the 6-7 years old children and adolescents, respectively. Austin et al¹⁵ observed a prevalence of 18.2 % of rhinoconjunctivitis among English adolescents. Falade et al¹⁶ observed a prevalence of 39.2 % among Nigerian adolescents.

Interference with daily activities has been reported in 0.5 % to 28.1 %, and 2.2 % to 57.4 % of the 6-7 years old and 13-14 years old children, respectively¹¹. In the present study, it has occurred in approximately 17.3 % and 19.3 % of children aged 6-7 and 13-14 years, respectively, being moderate to high in only 5 % of them. Therefore, although nasal symptoms were frequent, they resulted in little interference with daily activities, indicating low degree of disease severity.

The term “hay fever” has a positive predictive value of 71 % in detecting atopy among individuals with rhinitis¹¹, however in Brazil the prevalence of hay fever is very low, and the meaning of the word is not known by most people. For this reason, in the present study the question has been modified to “Has your child (you) ever had rhinitis?”

Among our children, the mean prevalence of “rhinitis ever” (medical diagnoses) was 19.9 % in both age groups. The highest values were observed in São Paulo, also in both age groups.

A history of previous diagnosis of rhinitis, assessed by the question “Has your child (you) ever had rhinitis”, is the simplest way to verify the prevalence of the disease, with a high degree of specificity. The accuracy of the response depends on several factors including consultation with a physician, the number of physicians consulted, and the understanding of the rhinitis diagnosis given by the physician. In addition, the patients' subjective approach to the diagnosis of rhinitis is important, and it is not uncommon for some patients to deny it.

In the city of Curitiba in South Brazil, Esteves et al¹⁷ have recently validated the ISAAC questionnaire after modifying it by adding the question “Has your child (you) ever had pollen allergy in the spring?” This

modification was based on the fact that, differently of the major part of the country, in this city patients with pollinosis have been identified.

The modified questionnaire, applied to children with perennial rhinitis, adults with pollen allergy and controls, showed high sensitivity and specificity for all questions, except pollen allergy in the spring, among children with allergic rhinitis. Among adults, there were reports of exacerbations during the spring months (September to December)¹⁷.

The percentage of returned WQ in ISAAC phase I varied between 60 % and 100 %, being higher among adolescents¹¹. In general, low WQ return indexes are associated to errors inversely to the prevalence of symptoms¹¹. In this study we observed satisfactory index of WQ return.

The rhinitis component of the ISAAC questionnaire, translated to Portuguese and applied to Brazilian children, has provided an adequate and a reproducible way to differentiate children with and without rhinitis¹².

This first international study of great magnitude, applying a standardized and validated instrument, allowed us to establish the prevalence of rhinitis in schoolchildren living in different cities of Brazil.

According to our observations the prevalence of rhinitis and its related symptoms in these cities was as high as that observed in other areas of the world. Other studies are still necessary to allow understanding the observed differences and to permit the adoption of more effective preventive measures.

REFERENCES

1. Gerber M, Brignoli R, Canevascini M, Wüthrich B. Epidemiological survey in hay fever patients. *Allergy* 1995;50:161-3.
2. Butland BK, Strachan DP, Lewis S, Bynner J, Butler N, Britton J. Investigation into the increase in hay fever and eczema at age 16 observed between the 1958 and 1970 British birth cohorts. *Br Med J* 1997;315:717-21.
3. Fleming DM, Crombie DL. Prevalence of asthma and hay fever in England and Wales. *Br Med J* 1987;294:279-83.
4. Burr ML, Butland BK, King S, Vaughan-William S. Changes in asthma prevalence: two surveys 15 years apart. *Arch Dis Child* 1989;64:1452-6.
5. Ninan T, Russell G. Respiratory symptoms and atopy in Aberdeen schoolchildren: evidence from two surveys 25 years apart. *Br Med J* 1992;304:873-5.
6. Aberg N, Hesselmar B, Aberg B, Eriksson B. Increase of asthma, allergic rhinitis and eczema in Swedish schoolchildren between 1979 and 1991. *Clin Exp Allergy* 1995;25:815-9.
7. Rimpelä AH, Savonius B, Rimpelä MK, Haahtela T. Asthma and allergic rhinitis among Finnish adolescents in 1977-1991. *Scand J Soc Med* 1995;23:60-5.
8. Nystad W, Magnus P, Gulsvik A, Skarpaas IJK, Carlsen KH. Changing prevalence of asthma in school children: evidence for diagnostic changes in asthma in two surveys 13 years apart. *Eur Respir J* 1997;10:1046-51.

9. Pearce N, Weiland S, Keil U, Langridge P, Anderson HR, Strachan D, et al. Self-reported prevalence of asthma symptoms in children in Australia, England, Germany and New Zealand: an international comparison using the ISAAC protocol. *Eur Respir J* 1993;6:1455-61.
10. Asher MI, Keil U, Anderson HR, Beasley R, Crane J, Martinez F et al. International study of asthma and allergies in childhood (ISAAC): rationale and methods. *Eur Respir J* 1995;8:483-91.
11. Strachan D, Sibbald B, Weiland S, Ait-Khaled N, Anabwani G, Anderson HR et al. Worldwide variations in prevalence of symptoms of allergic rhinoconjunctivitis in children: the International Study of Asthma and Allergies in Childhood (ISAAC). *Pediatr Allergy Immunol* 1997;8:161-76.
12. Vanna AT, Yamada E, Arruda LK, Nasipitz CK, Solé D. International Study of Asthma and Allergies in Childhood: validation of the rhinitis symptom questionnaire and prevalence of rhinitis in schoolchildren in Sao Paulo, Brazil. *Pediatr Allergy Immunol*. 2001;12:95-101.
13. Fletcher RH, Fletcher SW, Wagner EH. *Epidemiologia clínica: elementos essenciais*. 3ª ed. Porto Alegre, Artes Médicas, 1996; p. 281.
14. Remes ST, Korppi M, Kajosaari M, Koivikko A, Soininen L, Pekkanen J. Prevalence of allergic rhinitis and atopic dermatitis among children in four regions of Finland. *Allergy* 1998; 53:682-7.
15. Austin JB, Kaur B, Anderson HR, Burr M, Harkins LS, Strachan DP et al. Hay fever, eczema, and wheeze: a nationwide UK study (ISAAC, International study of asthma and allergies in childhood). *Arch Dis Child* 1999;81:225-30.
16. Falade AG, Olawuyi F, Osinusi K, Onadeko BO. Prevalence and severity of symptoms of asthma, allergic rhino-conjunctivitis and atopic eczema in secondary schoolchildren in Ibadan, Nigeria. *East Afr Med J* 1998;75:695-8.
17. Esteves PC, Trippia SG, Rosário Filho NA, Caleffe LG. Validação do questionário da ISAAC para rinite alérgica perene e sazonal (polinose). *Rev bras alerg imunopatol* 1999;22:106-13.