Risk factors for atopic eczema in school children

Fatores de risco para eczema atópico em escolares

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Abstract

Objectives: to study risk factors related to atopic eczema (AE) in school children of São Paulo.

Methods: 1972 parents or guardians of 6-7 years old children in the Southern Central area of São Paulo answered to a written questionnaire (standardized questionnaire of the International Study of Asthma and Allergies in Childhood plus a complementary questionnaire regarding family history of asthma and allergies, and exposure to environmental allergens). AE was defined by the presence of an itchy rash in the last year. Risk factors were analyzed through logical regression.

Results: the following factors were significantly associated with AE: history of maternal (OR: 4.1; 95%CI: 2.4 to 7.1) and paternal eczema (OR: 2.6; 95%CI: 1.4 to 5.0), dust in the child's bedroom (OR: 1.6; 95%CI: 1.1 to 2.4), lower maternal education (OR: 1.7; 95%CI: 1.1 to 2.7), rhinitis fever (OR: 1.7; 95%CI: 1.1 to 2.9) and wheezing in the last year (OR: 1.9; 95%CI: 1.2 to 2.8).

Conclusions: our data suggest that AE has a specific pattern of inheritance. The presence of dust in the child's bedroom was the single environmental risk factor found. Diagnose of other allergic diseases, as well as the presence of recent symptoms were strongly associated with AE in children.

Key words *Dermatitis, atopic, Risk factors, Child*

Resumo

Objetivos: identificar fatores de risco relacionados ao eczema atópico (EA) em escolares do município de São Paulo.

Métodos: 1972 pais de escolares de 6-7 anos da região centro-sul de São Paulo responderam a questionários escritos (questionário padrão do International Study of Asthma and Allergies in Childhood e questionário complementar sobre história familiar de doenças alérgicas e exposição ambiental a potenciais fontes de alérgenos e irritantes). A presença de manchas na pele com coceira nos últimos 12 meses, definiu os escolares com EA. Os fatores de risco foram analisados por regressão logística.

Resultados: as variáveis significantemente associadas ao EA foram: história materna (OR: 4,1; IC95%: 2,4 a 7,1) e paterna de eczema (OR: 2,6; IC95%: 1,4 a 5,0), presença de pó no dormitório (OR: 1,6; IC95%: 1,1 a 2,4), menor escolaridade materna (OR: 1,7; IC95%: 1,1 a 2,7), relato de sibilos no último ano (OR: 1,9; IC95%: 1,2 a 2,8) e de rinite alguma vez (OR: 1,7; IC95%: 1,1 a 2,9).

Conclusões: a análise dos dados sugeriu haver um padrão específico de herança genética para o EA. A presença de pó no quarto foi o único fator de risco ambiental encontrado. Sintomas e diagnóstico de outras doenças atópicas associaram-se fortemente às manifestações de EA.

Palavras-chave *Dermatite atópica, Fatores de risco, Criança*

Introduction

Atopic eczema (AE) also known as atopic dermatitis is characterized by chronic skin inflammation of individuals with a personal history of atopya. There are no clinical or laboratorial tests which are pathognomonic of AE and disease diagnosis is usually made through the association of different clinical signs such as pruriginous dermatitis, flexural or facial eczema, xerosis, palm hyperlinearity and peri-auricular fissures.[1] Although not potentially a severe disease AE can be the source of major discomfort for children causing psychological disturbances and sleeping disorders.[2,3] National research estimates that over 10% of the pediatric population suffers from AE.[4,5]

Pathogenesis and natural history of AE are not very well known. Genetic and environmental factors are related to the disease manifestation and onset. Many current researched factors are linked to the potential causes of the variations observed in AE prevalence. Among the most extensively studied one could cite family history and atopya, other atopic signs in the child, social, economic and cultural levels, number of siblings and family size, household exposure to allergens and irritating substances and early antibiotic use, type of delivery, infectious and parasitary diseases.[6,7] Nevertheless, there are no national data related to the analysis of possible risk factors for AE onset in children.

This paper aimed at studying some of the factors possibly related to AE in school children in the Central-Southern region of the city of São Paulo.

Methods

Schools located in the Central-South region of the city of São Paulo, Brazil, as defined by the Companhia de Engenharia de Tráfego (CET). Data from the Education Secretariat of the Municipality of São Paulo indicated that there were approximately 170 schools in this region, with school children ranging from six to seven years old, with an approximate number of 20.000 students. Of the 30 schools selected at random (table of random numbers), 23 agreed to participate of the study. Following contact with principals/ coordinators of the schools, written questionnaires (WQ) were delivered to the students between six years old and one day and seven years old, 11 months and 29 days (N = 2739) by their respective teachers to be taken home and to be filled by their parents or guardians and afterwards returned to school. Questionnaires were delivered and collected between the months of August and December 1999.

The questionnaire was based on the SQ Standard questionnaire of the "International Study of Asthma and Allergies in Childhood (ISAAC)"[8] and by a complementary questionnaire (CQ). The ISAAC CQ (not validated), adapted from the questions suggested through the orientation committee for ISAAC study contains questions related to asthma, rhinitis and eczema family history, the presence of smokers in the household, of dogs and cats plus humidity and dust mites in the infants'bedrooms.

This paper consists in a control-case study in which the cases were defined by the affirmative answer to the number two question of the Standard questionnaire of ISAAC in the AE module: "*In the last 12 months, did your son (daughter) suffer from skin rashes and itching (eczema) which appeared and disappeared*?" School children with negative answers were defined as controls.

Following the filled questionnaires return, data collected were transcribed by the author through the Excel software. The statistics packet Stata and SPSS 10 were used to analyze data. Sample size was defined in each of the groups considering an 11% difference between studied variables prevalence. Chi-Square and the Exact Fisher Test were used to test the individual association between the variables, while joint data analysis was made through logical regression. In the initial model all possible risk factors were included and following that, successive regression analysis had progressive non-significant variables gradually removed according to their significance value.[9,10] Family histories of asthma and bronchitis were jointly analyzed because they are, in our environment, identified by the lay population as being the same. The study was submitted and approved by the Medical Research Ethics Committee of the Federal University of São Paulo, (Escola Paulista de Medicina).

Results

Of the 2739 questionnaires distributed among the school children, 1972 were correctly and thoroughly filled, corresponding to a return rate of approximately 72.0%; 959 (48.6%) consisted of boys and 1013 (51.4%) of girls. Two hundred and five (10.4%) school children answered positively to the question of appearing and disappearing skin rashes in the last 12 months (cases) and 1767 (89.6%) of the children had negative answers (controls). Table 1 depicts the possible risk factors and their individual

relations with the variable selected for AE definition. The major odds ratio (OR) found was the AE history of mother, father and siblings. (Table 1) Significant variables at the end of the joint data analysis (maternal eczema, paternal eczema, dust mites in the household, wheezing in the last 12 months, rhinitis during lifetime and maternal school level) are depicted in Figure 1. Data linked to atopic eczema family history were again the ones presenting higher OR values, 4.14 for maternal history and 2.61 for paternal history.

Table 1

Individual association of possible risk factores to atopic eczema.

Question		Atopic eczema		*p*	OR	95%CI
		Yes (%)	No (%)			
		205 (10.4)	1767 (89.6)			
Maternal asthma *	Yes	13 (6.3)	95 (5.4)	0.6	1.18	0.6 - 2.1
	No	192 (93.7)	1672 (94.6)			
Paternal asthma *	Yes	12 (5.9)	67 (3.8)	0.2	1.55	0.8 - 2.9
	No	193 (94.1)	1700 (96.2)			
Sibling with asthma * ¶	Yes	13 (8.2)	79 (5.9)	0.2	1.44	0.8 - 2.7
	No	145 (91.8)	1254 (94.1)			
Maternal bronchitis *	Yes	48 (23.4)	267 (15.1)	0.003	1.72	1.2 - 2.4
	No	157 (76.6)	1500 (84.9)			
Paternal bronchitis *	Yes	31 (15.1)	221 (12.5)	0.3	1.25	0.8 - 1.9
	No	174 (84.9)	1546 (87.5)			
Sibling with bronchitis † ¶	Yes	72 (45.6)	389 (29.2)	<0.001	2.03	1.5 - 2.8
	No	86 (54.4)	1378 (70.8)			
Maternal rhinitis †	Yes	78 (38.0)	415 (23.5)	<0.001	2.00	1.5 - 2.7
	No	127 (62.0)	1352 (76.5)			
Paternal rhinitis †	Yes	51 (24.9)	249 (14.1)	<0.001	2.01	1.4 - 2.8
	No	199 (75.1)	1518 (85.9)			
Sibling with rhinitis † ¶	Yes	52 (32.9)	319 (23.9)	0.01	1.57	1.1 - 2.2
	No	106 (67.1)	1014 (76.1)			
Maternal eczema*	Yes	47 (22.9)	90 (5.1)	<0.001	5.48	3.7 - 8.1
	No	158 (77.1)	1677 (94.9)			
Paternal eczema *	Yes	34 (16.6)	67 (3.8)	<0.001	5.05	3.2 - 7.8
	No	171 (83.4)	1700 (96.2)			
Sibling with eczema * ¶	Yes	32 (20.3)	80 (6.0)	<0.001	3.98	2.5 - 6.2
	No	126 (79.7)	1253 (94.0)			
Smokers at home †	Yes	110 (53.7)	829 (46.9)	0.07	1.31	1.0 - 1.8
	No	95 (46.3)	938 (53.1)			
Dog in the house †	Yes	54 (26.3)	497 (28.1)	0.6	0.91	0.7 - 1.3
	No	151 (73.7)	1270 (71.9)			
Cat in the house †	Yes	20 (9.8)	143 (8.1)	0.4	1.2	0.7 - 2.0
	No	185 (90.2)	1624 (91.9)			

Continue

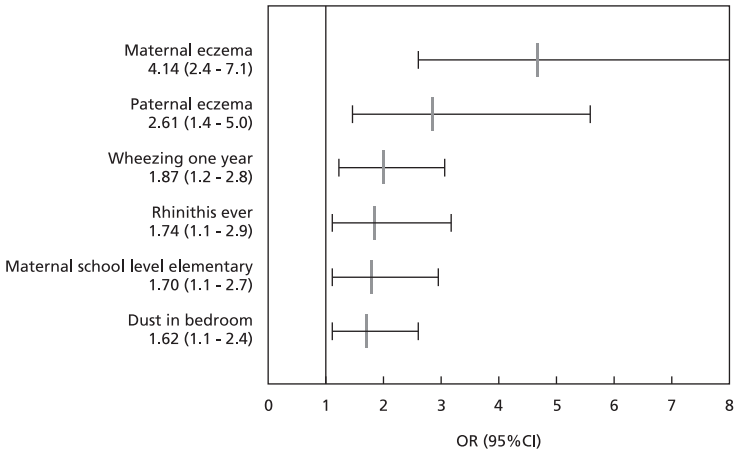
Continuation

Question		Atopic eczema		*p*	OR	95%CI
		Yes (%)	No (%)			
		205 (10.4)	1767 (89.6)			
Dust in the house †	Yes	135 (65.9)	882 (49.9)	<0.001	1.94	1.4 - 2.6
	No	70 (34.1)	885 (50.1)			
Mildew in the house *	Yes	27 (13.2)	166 (9.4)	0.1	1.46	0.9 - 2.3
	No	178 (86.8)	1601 (90.6)			
Humidity in the house #	Yes	31 (15.1)	216 (12.2)	0.2	1.29	0.9 - 1.9
	No	174 (84.9)	1551 (87.8)			
Wheezing in the last 12 months †	Yes	97 (47.3)	399 (22.6)	<0.001	3.07	2.3 - 4.1
	No	108 (52.7)	1368 (77.4)			
Nasal symptoms in the 12 months †	Yes	105 (51.2)	444 (25.1)	<0.001	3.13	2.3 - 4.2
	No	100 (48.8)	1323 (74.9)			
Asthma ever *	Yes	29 (14.1)	102 (5.8)	<0.001	2.66	1.7 - 4.1
	No	176 (85.9)	1665 (94.2)			
Rhinitis ever †	Yes	92 (44.9)	385 (21.8)	<0.001	2.92	2.2 - 3.9
	No	113 (55.1)	1382 (78.2)			
Male †	Yes	93 (45.4)	866 (49.0)	0.3	0.86	0.6 - 1.2
	No	112 (54.6)	901 (51.0)			
Maternal schooling (elementary school #) †	Yes	90 (48.9)	827 (52.1)	0.4	0.90	0.6 - 1.1
	No	115 (51.1)	940 (47.9)			

OR = Odds ratio; CI = confidence interval; * Fisher exact test; † = chi-square: yes x no; ¶ N = 1491 (yes = 158; no = 1333); elementary school (completed or not completed) versus incomplete high school or higher education.

Figura 1

Factors significantly associated to topic eczema at the end of logistic regression.



OR= Odds ratio

Discussion

Questionnaires have been intensively used in epidemiological studies. Confidence in the results obtained is dependent on the return rate reached. We obtained 72.0% of the Questionnaires, a rate considered good and within the range observed in the first phase of ISAAC, since in childhood that rate is between 60 and 100%.[11]

AE epidemiological studies definition is controversial with no "ideal" alternative. In this study we used as a diagnostic criterion for AE the affirmative answer to the question related to the condition's symptoms (rashes that appear and disappear for at least six months) in the last 12 months. This criterion was suggested by Yamada *et al.*[4] who validated the questionnaire in our environment. These authors demonstrated that such criterion is highly sensitive (87%) and specific (98%) for AE diagnosis and that the addition of other questions of the questionnaire to the diagnostic criterion reduces sensitivity without significant increase in specificity.

Of the ISAAC questionnaire four questions were selected for risk factors, two related with asthma and two with AR. The questions of asthma during lifetime and rhinitis during lifetime are commonly interpreted as the medical diagnosis of these conditions, while the two other questions relate to the recent (last year's) symptoms of these diseases. All four questions were factors significantly associated to the presence of symptoms in school children, in the isolated analysis of variables. OR found were similar for asthma and AR, close to 3.0.

Curiously enough only the symptoms for asthma and medical diagnosis for AR remained significant in the final model of logical regression. Medical sub-diagnosis of asthma, already evident from other studies, could have affected this variable. Our findings prove the already known association between asthma, AR and AE and reinforce the need of a joint approach for the two conditions.

The presence of family members with atopic diseases, with the exception of asthma was significantly associated to AE manifestations. Nevertheless, only maternal and paternal family histories remained significant when data joint analysis was performed, indicating that AE must follow a specific pattern of genetic heritage. Other studies already demonstrated a similar fact related to asthma and AR.[12-14]

The chance of children having AE was higher when the mother had it as compared to the father (OR = 4.14 and OR = 2.16, respectively.: Many authors have reported that the risk of a child developing an allergic disease is higher if the mother is allergic as compared to the father. When doing a review on the issue, Moffatt and Cookson[15] concluded that the majority of studies employing objective measures, such as skin tests and determination of serum IgE were favorable to the higher maternal history effect. The report of fathers' eczema in our study, could, nevertheless, have been underestimated for the questionnaires might have been filled preferably by the children's mothers, rather than fathers.

Estimates on the level of household exposure to dust mites through questionnaires are difficult to obtain. Many factors could change the levels of dust mites in the household, such as humidity, the number of residents, the type of flooring and housekeeping habits.[16]

In the current research we questioned parents and guardians directly on the presence of dust in the child's bedroom, because bedrooms usually have higher concentration of dust mites17 and school children spend most of their time there. Notwithstanding the outstanding subjectivity of the question, the presence of dust in the child's bedroom was significantly associated, not only through individual analysis, but when joint variables were analyzed as well, to the presence of AE. It was, in fact, the only environmental risk factor determined. Although intensively discussed, evidences are still scarce when attempting to relate the onset of AE to the environmental exposure to dust mites, the principal allergens in household dust.[1,18] Randomized essays on environmental control measures for dust mites have depicted conflicting results in the clinical improvement of AE patients[19,20] and there are almost no cross cut studies relating AE with higher household dust mites' levels.[21] On the other hand, it is known that dust mites antigens are capable of crossing the epidermis and causing a specific immune response in the skin of individuals with AE.[22] In addition, the major part of AE patients are dust mite sensitive[23] and the degree of sensitivity to aeroallergens seem to correlate to AE severity.[24]

Domestic animals, although being dust mite carriers and sources of household allergens are not usually implied as being responsible for symptoms onset in AE patients. Other cross cut studies, in addition to ours, prove the absence of this association.[25,26]

The lower level of maternal schooling was determined to be a risk factor for AE symptoms in the current study. This association was significant only in the logical regression analysis of variables.[18] It could be speculated that children belonging to lower social and economic levels are more prone to infec-

tious, chronic and recurrent dermatitis which could be interpreted or confused with AE rashes.

It has been reported that AE is prevalent among female children and adolescents,[11,27] Nevertheless, in this study, gender was not found determinant for AE risk.

Exposure to tobacco smoke has been recognized as a risk factor for asthma in childhood, but its effect in the development or aggravation of AE is still controversial and lacking in concrete evidence.[28] In the individual factors analysis, association between AE and tobacco exposure was not significant but was very close to that ($p = 0,07$; Table 1). This trend, nevertheless, has not been confirmed in the joint data analysis.

This study has some constraints which are common to the ones obtained from questionnaires' information. Diagnostic criterion of AE could be criticized and it is not improbable that other chronic dermatitis were sorted as being AE. Approximately half of the mothers of the children in the study had a low education level (elementary school) therefore, they could have had problems in understanding the questionnaire. It is not possible to study environmental exposure in early childhood which might have furnished further information.

In this study, we have attempted to analyze the highest possible number of AE related factors. Nevertheless, there was the concern of not unduly extending the questionnaire which would demand more time to fill it, thus reducing the return rates. Some of the questions, specially the ones related to perinatal events, are difficult to memorize, therefore, these tend to be highly inaccurate. Other factors are too complex to be assessed through one or two questions. Nevertheless, some important factors could have been included in the questionnaire such as family size and number of siblings.

In conclusion, this study introduces an analysis of different potential risk factors for AE. Results indicate a strong association between AE and the presence of symptoms and medical diagnosis of other atopic diseases. They indicate, as well, a specific standard of genetic inheritance and that the presence of dust is a risk factor to the onset of AE symptoms.

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