

Atopic dermatitis and risk factors in poor children from Great Buenos Aires, Argentina

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Summary

Background. In recent decades, the prevalence of atopic dermatitis (AD) has risen steadily, and risk factors for AD are currently being investigated worldwide. In Argentina, there are no available data on risk factors of AD.

Aim. To determine the prevalence of and any gender predilection for AD, and to identify familial and environmental factors that are associated with increased AD risk.

Methods. In this case-control cross sectional study, 603 children aged 12–60 months old from a poor urban community in Buenos Aires were recruited. AD was defined following UK Working Party Diagnostic Criteria. We evaluated the relationship between AD and the presence of family history of atopy, > 5 family members, wearing synthetic clothes, having a carpeted room, eating ≥ 3 eggs/week, tobacco smoking indoors by family members, and living < 300 m from a main road, polluted stream or industry.

Results. The prevalence of AD was 41.1% (95% CI 37.2–45.2%). Logistic regression analysis showed that AD was significantly associated only with a family history of atopy (OR = 5.7; 95% CI 3.7–8.8%; $P = 0.0000$), wearing synthetic clothes (OR = 2.2; 95% CI 1.4–3.5; $P = 0.0009$), having a carpeted room OR = 1.9; 95% CI 1.2–3.0%; $P = 0.009$) and living < 300 m from an industry (OR = 1.93; 95% CI 1.2–3.1%; $P = 0.0051$).

Conclusion. We found a high prevalence of AD in our study population. Not all the investigated risk factors for AD had a significant association with the disease.

Introduction

Atopic dermatitis (AD) is the most common inflammatory skin disease in childhood, often appearing in early infancy and with a natural course varying considerably over time. In recent decades the prevalence of AD has risen steadily, and in some countries it has more than doubled since 1960.¹ Differences in the frequency of AD based on familial, geographical and socioeconomic factors suggest a role of these risk factors in the

pathogenesis of AD. Reports in the literature indicate an important role for the 'western lifestyle' in the development of AD, but there are few data available for Argentina.

Our daily clinical experience in a poor community of Great Buenos Aires revealed a surprisingly high number of young children with a diagnosis of AD. The aims of the study, therefore, were to determine in this community the prevalence of AD and any gender predilection, and to identify familial and environmental factors that are associated with increased AD risk.

Materials and methods

The study was approved by the local ethics committee. This was a case-control, longitudinal, cross-sectional study, carried out in a highly polluted area

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of 0.96 km² in size, located in San Francisco Solano, part of the Quilmes district, which is situated in the south of Great Buenos Aires, 20 km away from the Argentinean capital city. This area had a population of 893 children aged 12–60 months according to the last census. In this cross-sectional study, between May 2005 and April 2006, we recruited 603 healthy children of both genders in this age range from a poor urban community. Participation in this investigation was voluntary, but resulted in a response rate of 93%; the percentage finally enrolled in the study was 67.5% of the total. A structured questionnaire was used to record data on possible risk factors. Individuals with incomplete information were excluded from the study.

AD was defined following the UK Working Party's Diagnostic Criteria.² The study was performed in a paediatric setting and the diagnosis of AD was confirmed simultaneously by a dermatologist and a paediatrician.

The risk factors for AD that were evaluated in the study were: (i) family history of atopy, (ii) small household (≤ 4 people living together), (iii) wearing of synthetic fibres in direct contact with the skin, (iv) tobacco smoking indoors, (v) having ≥ 1 carpeted rooms, (vi) eating ≥ 3 eggs/week, and (vii) living < 300 m away from a main road, a polluted stream or an industry.

Statistical analysis

Children were selected using consecutive nonprobabilistic sampling. Sample size was calculated using the Stat-Calc program. Other statistical analyses were performed using the statistical package Epi info (version 3.3.2). The relationship between AD and the evaluated risk factors was assessed by the χ^2 test. A multivariate logistic regression analysis was used to assess independent effects of the risk factors on development of AD. All factors that approached significance by the χ^2 test were included in the model. Results are expressed as OR with 95% CI, and $P < 0.05$ was considered significant.

Results

Of the 603 children included in the present analysis (mean age 30 ± 15 months), 285 (47%) were girls and 318 (53%) were boys. The prevalence of AD was 41.1% (95% CI: 37.2–45.2) and was present in 40% of girls and 42.1% of boys (NS). Characteristics of the study participants by AD status are shown in Table 1.

Table 1 Characteristics of the sample by atopic dermatitis status.

Characteristic	Atopic dermatitis			
	Present, <i>n</i> = 248 (41.1%)		Absent, <i>n</i> = 355 (58.9%)	
	<i>n</i>	%	<i>n</i>	%
Gender				
Male	134	42.1	184	57.9
Female	114	40	171	60
Family history of atopy				
Yes	138	58.9	96	41.1
No	51	21	192	79
Family members				
≤ 4	102	39	159	61
> 4	146	42.7	196	57.3
Synthetic clothes				
Yes	106	54.3	89	45.7
No	142	34.8	266	65.2
Indoor tobacco smoking				
Yes	164	45.4	197	54.6
No	84	34.7	158	65.3
Carpeted rooms				
Yes	80	51.3	76	48.7
No	168	35.2	279	64.8
Ingestion of eggs				
< 3 /week	20	52.6	18	47.4
≥ 3 /week	228	40.3	337	59.7
Living < 300 m from:				
A main road				
Yes	153	40.7	223	59.3
No	95	41.8	132	58.2
A polluted stream				
Yes	101	48.1	109	51.9
No	147	37.4	246	62.6
An industry				
Yes	89	55.3	72	44.7
No	159	36	282	64

The univariate analysis showed that family history of atopy, wearing synthetic clothes, indoor tobacco smoking, having a carpeted room, and living < 300 m away from a polluted stream or an industry were related to AD (Table 2). The multivariate logistical regression analysis with adjustments for the significant covariables showed that family history of atopy, wearing synthetic clothes in direct contact to the skin, having a carpeted room and living near an industry were significant predictors of AD (Table 2), but no other factors were significant.

Discussion

The prevalence and incidence of AD have been studied in a variety of populations throughout the world. Prevalence rates range from as low as 0.73% in rural Tanzania to as high as 31.9% in one inland town of Australia.¹

Table 2 Univariate and multivariate analysis of AD risk factors.

Characteristic	Univariate analysis			Multivariate analysis		
	OR	95% CI	P value	OR	95% CI	P value
Infant gender	0.9	0.7–1.3	NS	–	–	–
Family history of atopy	5.4	3.6–8.1	0	5.7	3.7–8.8	0
Family members	0.9	0.6–1.2	NS	–	–	–
Synthetic clothes	2.2	1.6–3.2	0	2.2	1.4–3.5	0.009
Indoor tobacco smoking	1.6	1.1–2.2	0.008	1.5	0.9–2.3	0.07
Carpeted rooms	1.7	1.2–2.5	0.002	1.9	1.2–3	0.009
Eggs ingestion	1.6	0.8–3.2	NS	–	–	–
Living < 300 m from:						
A main road	0.9	0.7–1.3	NS	–	–	–
A polluted stream	1.6	1.1–2.2	0.01	1.1	0.7–1.7	0.62
An industry	2.2	1.5–3.2	0	1.9	1.2–3.1	0.005

NS, non-significant.

There are few available data in the local literature on the prevalence of AD in Argentina. The only report from our country used a questionnaire in the International Study of Asthma and Allergies in Childhood, where a prevalence of AD of 7.5% was reported.³ In our study, we examined 67.5% of the 12–60-month-old children from a Healthcare System Programmatic Area, where the study was carried out, and found a prevalence of AD of 41.1%. According to the literature, in this investigation, where the diagnosis of AD was made simultaneously by a dermatologist and paediatrician, we found the highest prevalence of AD. Although children were not randomly selected, we had a high response rate, therefore we consider that our findings were not related to the selection method used.

Comparing rates of AD is difficult, because of incompatible study designs, different study populations and case definitions, and non-uniform methods of measurement. Recently Johnke *et al.*⁴ demonstrated in a cohort study that, at least from the age of 12 months, the AD prevalence is independent of the diagnostic criteria used. This supports our belief that the high prevalence of AD we found is not related to the diagnostic criteria chosen and is also in agreement with our previous clinical experience.

There is a natural history of improvement of AD by the onset of adolescence.^{5,6} However Illi *et al.*⁷ reported that the prevalence of AD falls earlier than this, and becomes stable by the age of 4 years. Our sample was composed of children in early infancy, which could partially explain the results we have found.

The prevalence of AD varies considerably from one country to another, and also within countries.⁵ This concept may justify the differences found between the Argentinean rates of AD published by Williams *et al.*³ in their international study and our results.

Migrant studies have suggested a strong role for environment in development of AD. Various investigations have shown that populations from countries where there is a low prevalence of AD have rates that are similar or higher than those in the adopted countries after they migrate. Possible risk factors may be differences in exposure to aeroallergens or differences in climate, diet or microbial colonization.⁵ Although the origin and ethnic group were not variables we investigated, it is likely that the high prevalence of AD found could be a consequence of the population studied, which has a high migrant rate, with many of the studied families originating from other parts of Argentina or from neighbouring countries.

Increasing rates of prevalence of AD may also be associated with areas of industrialization and urbanization, and with higher socioeconomic class.^{1,5} We evaluated children from a poor urban community with low socioeconomic status, but surprisingly, found a very high prevalence of AD in this low-income population.

The possibility of gender predilection in AD is controversial. Many investigators have found a higher prevalence of this illness in male patients.^{4,8} In contrast, other investigations have reported that women are more affected.^{3,5,9,10} In our sample, there was no significant difference between the genders in the prevalence of AD, which is in agreement with other studies.^{11–13}

There is strong evidence to suggest that genetic factors are important in predisposition to AD. Our study found an increased risk of AD in infants born in families with a history of atopy, and this risk factor was the most important one for the development of AD in our sample. These findings are consistent with previous reports.^{4,5,8,11,14,15} It is known that children with first-degree relatives with atopy, particularly mothers,

have an increased risk of AD.^{4,8,9,11,12} Although it was not an aim of this study, we found that 52.9% of the children with AD had a positive family history of AD in first-degree relatives.

The risk of developing AD is also higher in children growing up in smaller families and in families of higher socioeconomic status.^{1,5} Reasons for this increased risk of AD may be attributable to increased exposure to medical care, increased immunization and a more allergenic home environment.¹ This strongly suggests that risk factors for AD might be related to a 'Western' lifestyle. In the infants we evaluated, most of whom came from low-income families with ≥ 5 members (56.7%), we did not find a relationship between this risk factor and AD.

AD is related to intolerance to wool, whereas irritation by synthetic fibre is still a matter of discussion.¹⁶ Our study showed that the irritative capacity of synthetic clothes in direct contact with the skin was significantly higher in patients with AD. Similar findings were reported by Diepgen *et al.*¹⁷ Although it is common advice that children should wear cotton clothing next to the skin, we found that 32% of the evaluated patients did not follow this recommendation.

The role of passive smoking in the development of AD is controversial.^{14,18} Tobacco smoking indoors was reported by 60% of the relatives of the studied children, but we did not find a significant relationship between this habit and AD.

Dermatophagoides pteronyssinus, the house dust mite (HDM) is widely suspected to be an important factor in the pathogenesis of AD.¹⁹ HDMs are found in all homes, but are present in greater numbers in homes with large carpeted areas. The triggering role of HDM in AD is still under discussion. Tan *et al.*¹⁹ reported that the activity of AD can be greatly reduced by effective HDM avoidance, but Harris *et al.*²⁰ found a protective effect for AD of exposure to HDM in early life. Only 26% of the parents in our study reported having a carpeted room, but this risk factor was still significantly related to AD.

Food allergy is more common in childhood than in adulthood. It affects approximately 6% of children, with the highest prevalence during the first year of life. Cows' milk followed by eggs are the most common offenders. Food-sensitive children have a high incidence of family history of allergy. The highest incidence of food allergy is in atopic children, particularly in those with AD.²¹ There is as yet no reliable simple test for the identification of individual food triggers in AD.⁵ We investigated if the ingestion of ≥ 3 eggs/week (present only in 6% of our patients) was related to AD, but found no association.

Children have been identified to be at higher risk from air pollution. The lung is not well-formed at birth and development continues over the first 6 years of life. Inhaled allergens have been implicated in the aetio-pathogenesis of AD.²² Children generally spend more time outdoors, which increases exposure time. Ozone, benzene, diesel exhaust particles, nitrogen dioxide, sulphur dioxide, particulate matter and heavy metals, such as nickel, copper, arsenic, and aluminium compounds, are known to be respiratory irritants and pro-inflammatory.^{10,22} Examination of pollution-associated risk factors of AD found that 62% reported living < 300 m away from a main road, 35% reported living < 300 m away from a polluted stream, and 27% reported living < 300 m away from an industry. Only the last risk factor was associated with AD in the logistic regression model. Although we did not analyse the relationship between the type of industry and the development of AD, living near a cement factory, which is one of the six reported industries from the evaluated area, was the most commonly reported.

In conclusion, our study on AD in poor children from Great Buenos Aires, Argentina, showed a very high prevalence of this illness, with no gender difference. Family history of AD, wearing synthetic clothes in direct contact with skin, having a carpeted room and living < 300 m away from an industry were the only risk factors significantly associated with AD. Further investigations with greater samples in other populations with similar features are needed to confirm our results.

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