

Birth Month and Prevalence of Atopic Dermatitis in Children Under 3 Years in Antananarivo, Madagascar

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Background: Several studies have been done to evaluate the relationship between month of birth and atopic diseases but the results are contradictory.

Objective: We aim to evaluate the correlation between the month of birth and the prevalence of AD in Malagasy children less than 3 years.

Methods: A case-control study was conducted based on patients' data of the department of Dermatology in the University Hospital Joseph Raseta Befelatanana (UH/JRB) Antananarivo. It included 438 children less than 3 years seen in this department between January 2010 and December 2019. For each atopic dermatitis (AD) patient, two age- and sex-matched controls without a history of AD were selected from the same period.

Results: This study included 146 AD cases and 292 non-AD controls. Our case-control study found that there is a statistically significant correlation between birth month and risk of AD in Malagasy children <3 years. Compared with people born in December, people born in April had the highest risk of AD (OR: 2.11, 95% CI 0.93–4.78), followed by people born in March (OR: 1.52, 95% CI 0.79–2.88). Asthma, allergic rhinitis and allergic conjunctivitis were significantly correlated with AD in our patients.

Conclusion: Our case-control study found that being born in April and March (dry season) may be associated with an increased risk of AD.

Keywords: birth month, atopic dermatitis, children, Madagascar

Background

Atopic dermatitis (AD) is a chronic or recurrent inflammatory skin disease characterized by xerotic and pruritic skin. The etiology of AD is multifactorial with interaction between genetics, immune and environmental factors.¹ As in industrialized countries, the incidence of AD in patients < 15 years increased from 1.02% in 1999 to 5.6% in 2019 in Madagascar.^{2,3}

Some studies conducted in white populations showed an association between birth season and AD.^{4–6} A previous cross-sectional study in Antananarivo Madagascar reported that children born in the dry season had the highest risk of AD.⁷ In order to affirm this result, we aimed to evaluate the correlation between the month of birth and the prevalence of AD in Malagasy children less than 3 years old by using an appropriate study design.

Methods

A case-control study was conducted based on patients' data at the department of dermatology in the University Hospital Joseph Raseta Befelatanana (UH/JRB) Antananarivo which is the hospital reference center in the capital of Madagascar.

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We included children less than 3 years old seen in the department of dermatology in the UH/JRB Antananarivo between January 2010 and December 2019.

We included 438 children aged 3 years and younger. AD was diagnosed by a dermatologist according to the criteria of United Kingdom Working Party modified. For each AD patient, two age- and sex-matched controls without a history of AD were selected from the same period.

This study was approved by the Ethics Committee of the University Hospital Joseph Raseta Befelatanana Antananarivo Madagascar, and it was conducted in accordance with the Declaration of Helsinki. Study participants and their parents were informed about the study procedures and written informed consent was obtained.

Statistical Analysis

Statistical analysis was conducted using STATA software version 12. All data were analyzed using a Chi-squared (X^2) test for differences in the prevalence of related AD. Odds ratios (ORs) and 95% confidence intervals (CIs) were computed with the logistic regression analysis after taking the confounding variables into account. Significance was set at $p < 0.05$.

Results

A total of 438 children ≤ 3 years were included: 146 AD cases and 292 non-AD controls. The baseline characteristics of the children included is shown in Table 1.

The two groups were matched by gender and age. A significant association was found between the prevalence of AD and the month of birth. The fewest children with AD were born in December (4.1%, OR: 0.41, CI

Table 2 Correlation Between Month of Birth and Incidence of AD

	AD Cases (N=146) n (%)	Non-AD Controls (N=292) n (%)	OR	CI (95%)	P
January	12 (8.21)	27 (9.24)	0.97	0.49–1.96	0.35
February	15 (10.27)	28 (9.58)	1.17	0.51–2.14	0.29
March	21 (14.38)	29 (9.93)	1.52	0.79–2.88	0.04
April	15 (10.27)	15 (5.13)	2.11	0.93–4.78	0.03
May	14 (9.58)	21 (7.19)	1.36	0.62–2.92	0.14
June	12 (8.21)	23 (7.87)	1.04	0.46–2.27	0.92
July	9 (6.16)	21 (7.11)	0.84	0.33–1.99	0.84
August	10 (6.84)	20 (6.84)	1	0.4–2.31	1
September	12 (8.21)	27 (9.24)	0.85	0.39–1.86	0.72
October	12 (8.21)	33 (11.3)	0.76	0.31–1.45	0.39
November	8 (5.47)	20 (6.84)	0.68	0.21–1.72	0.48
December	6 (4.1)	28 (9.58)	0.41	0.13–1.02	0.05

95%: 0.13–1.02), and the most were born in April (10.27%, OR: 2.11; CI 95%: 0.93–4.78) and March (14.38%, OR: 1.52; CI 95%: 0.79–2.88). The correlation between month of birth and incidence of AD is shown in Table 2.

Compared with children without AD, those with AD had a higher proportion of asthma (14.4% vs 2.12%; OR 7.27, 95% CI: 2.47–25.72; p 0.000006), allergic rhinitis (8.9% vs 2.1%; OR: 3.54, CI 95%: 1.13–12.15; p 0.01). Family atopy was not associated with the AD risk. The correlation between other medical conditions and AD is shown in Table 3.

Discussion

Our case-control study found that there is a statistically significant correlation between birth month and risk of AD. Compared with children born in December (rainy season), those born in April and March (dry season) had the highest risk of AD. In Madagascar, the month with the highest relative humidity is December (81.5%), the average rainfall is 278.9 mm. The average humidity in April and March is 74.5% with an average rainfall at 10.4 mm. Several studies have been done to clarify a relationship between month of birth and atopic diseases but the results are contradictory. Our result was consistent with other studies which found that manifestation of atopy is related to the patient's month of birth. A population-based study in Taiwan found that patients born in December, October and November (dry season) have a higher risk of developing AD; this study hypothesized that the skin

Table 1 The Characteristics of Children with AD and Without AD (Controls)

	AND (%)	Controls N (%)
Gender		
Female	74 (50.6)	148 (50.7)
Male	72 (49.3)	144 (49.3)
Age (months)		
0–12	94 (64.3%)	187 (64.04%)
13–24	42 (28.76%)	84 (28.76%)
25–36	10 (6.84%)	21 (7.19%)
Geographic origin		
Rural	73 (50%)	144 (49.3%)
Urban	73 (50%)	148 (50.6%)

Table 3 Coexisting Medical Conditions in Children with and without AD

	AD Cases	Non-AD Controls	X ²	p	ORs	CI (95%)
Allergic rhinitis						
No	122 (835%)	276 (945%)	8.38	0.0032	2.90	1.65–7.04
Yes	24 (16.4%)	16 (5.4%)				
Allergicconjunctivitis						
No	133 (91.09%)	286 (97.94%)	5.96	0.01	3.54	1.13–12.15
Yes	13 (8.9%)	6 (2.1%)				
Asthma						
No	124 (85.60%)	287 (97.88%)	19.11	0.000006	7.27	2.47–25.72
Yes	22 (14.40%)	5 (2.12%)				
Vitiligo						
No	146 (100%)	277 (94.86%)	–0.00	0.0020		
Yes	0 (0%)	15 (5.14%)				
Urticaria						
No	144 (98.63%)	290 (99.31%)	0.48	0.40	2017	0.14–28.09
Yes	2 (1.70%)	2 (0.85%)				
Family atopy						
No	89 (60.9%)	269 (92.12%)	36.22	1.86	7.48	4.23–13.45
Yes	57 (39.04%)	23 (7.87%)				
Other medical past history						
No	144 (98.6%)	269 (92.12%)	9.65	0.004	0.16	0.018–0.67
Yes	2 (1.36%)	23 (7.87%)				

condition is affected by the climate in early infancy.⁴ A Japanese study reported also that children born in autumn (October, November and December) had a higher risk of developing AD compared to those born in spring (April, May and June).⁵ One study in Armenian pediatric patients in 2018 showed that being born in winter was associated with a lower risk of developing severe AD when compared to spring. It may be explained by the exposure to grass pollen which is the most significant allergen in Armenia.⁶ In our study, children born in the dry season had a higher risk of AD. So the lack of humidity during the dry season may affect the skin condition. However, other studies in Germany⁸ and in Denmark⁹ found that manifestation of atopy is not related to the patient's month of birth. Several arguments may explain the variability of these results.

Our study showed that allergic rhinitis, allergic conjunctivitis, urticaria and asthma were coexisting diseases associated with the AD risk. Our findings were consistent with previous investigations suggesting that asthma,^{10–12} allergic rhinitis^{13,14} and allergic conjunctivitis¹⁵ were correlated with AD. This association may be explained by the “atopic march” which refers to the natural history of

allergic diseases as they develop over the course of infancy and childhood. It describes the progression of atopic disorders from AD in infants to asthma and allergic rhinitis in children.¹⁶

Our study had limitations; it was a retrospective study so it was a study of association but not direct causation. Prospective studies are still needed to validate the causal relationship between birth month and AD.

Conclusion

Our case-control study found that being born in April or March (dry season) may be associated with an increased risk of AD. Our study shows also that AD was associated with asthma, allergic rhinitis, allergic conjunctivitis, and urticaria.

Abbreviations

AD, atopic dermatitis; UH/JRB, University Hospital Joseph Raseta Befelatanana; OR, odds ratio; CI, confidence Interval.

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Disclosure

The authors report no conflicts of interest in this work.

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