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Clinicaland sociodemographic risk factors associated with atopic dermatitis in children:A single-center observational study

Paola Belén Guambo Heredia*[1] ID, Luz María Dressendörfer Garcés[1] ID

1. Faculty of Medicine, Pontifical Catholic University of Ecuador.

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Abstract

Introduction: Atopic dermatitis is a chronic inflammatory atopic skin disorder with the most frequent onset in children under five. This study aimed to determine clinical and sociodemographic risk factors associated with atopic dermatitis in a group of school children in Riobamba, Ecuador.

Methods: The present observational study included schoolchildren in the period June-August 2020. A probabilistic sample included cases with atopic dermatitis (AD) and a control group. The variables were atopic dermatitis, age,sex, family and personal history of atopy, maternal exposure to tobacco smoke during pregnancy or in childhood, duration of exclusive breastfeeding, parental educational level, type of residence, family type, presence of older children and pets at home, frequency of grooming, and duration of showering. The odds ratio is presented with a 95% confidence interval.

Results: A total of 175 schoolchildren were included, 28 (14.2%) with AD. Alternatively, for exposure to secondhand smoke in childhood = 3.7, OR small families = 2.5 (*P* =0.042) OR for maternal history of allergic rhinitis 2.6, OR atopic dermatitis in parents = 9.0.

Conclusion: It is confirmed that the family history of diseases such as allergic rhinitis and atopic dermatitis, as well as the personal history of diseases that are part of the atopic spectrum other than AD, exposure to tobacco smoke at home and living with a small number of members within the family, are risk factors associated with atopic dermatitis.

Keywords: MESH: Atopic dermatitis, allergic rhinitis, lactation, asthma, pathology.

Introduction

Atopic dermatitis in Latin America presents a prevalence of 15 to 20% [1], affecting mainly children of primary and secondary school; however, in Ecuador, despite belonging to the Andean region where the climatic condition and other environmental and sociodemographic factors predispose to developing this type of pathology, the studies that have been carried

* Corresponding author.

Paola Belén Guambo Heredia/Address: Ave 12 de Octubre 1076, Quito 170143. Telephone: [593] (02) 2991700

out do not present unified epidemiological data that can describe the actual prevalence of the disease [1].

The lack of knowledge of primary care health personnel about the diagnosis, prevention, and adequate management of this pathology causes the disease's subdiagnosis, resulting in a decreased quality of life for those who suffer from it [2]. Added to this is the need for more resources for the specific treatment of this pathology at the general level and the poor education toward families that within the management recommendations could be fundamental pillars for proactive management of the pathology and even for preventing this disease [3].

The evidence to date documents that atopic dermatitis is a multifactorialdisease triggered by environmental conditions added to the social stratum and family history, which creates a conflict in the evaluation and treatment of patients [4].

In Ecuador, dermatological diseases are usually pathologies of minor importance within health policies. Since there are no relevant studies that support the importance of diagnosis and knowledge of risk factors that modify the course of the diseasein children with atopic dermatitis to achieve individualized and adequate management, it is considered pertinent to carry out this project as a contribution to the understanding of the factors associated with the pathology.

The objective of this study was to determine the clinical and sociodemographic risk factors associated with atopic dermatitis in schoolchildren from a public center in the city of Riobamba, Ecuador, in the period June–August 2020.

Materials and methods

Design of the investigation

This is an observational, analytical study, and the source was prospective.

Scenery

The study was carried out at the Santo Tomás Apóstol Riobamba Educational Unit in June–August 2020.

Inclusion criteria

Children from the first to the third year of primary education entered the study. Cases with incomplete questionnaires thatdid not allow analysis were eliminated from the study.

Study size

The population consisted of children enrolled in the institution who met the entry requirements. The sample calculation was probabilistic,and the total number of students was 503. The sample calculation used the following formula:

$$n = (Z\ 2 \times q \times p \times N)/e\ 2 \times (N \quad -1) + Z\ 2 \times q \times p$$

With a confidence interval of 95%, an estimated prevalence of 22.5%, and a sampling error of 5%, the estimated number was 175 surveys.

Variables

The variables were atopic dermatitis, age, sex, family and personal history of atopy, maternal exposure to tobacco smoke during pregnancy or childhood, duration of exclusive breastfeeding, parental level of education, type of residence, type of family, presence of older children and pets at home, frequencyof grooming, and duration of showering.

Data sources/measurement

The data were collected through an electronic survey carried out on the parents of the student.sThrough a virtual session of parents via zoom, the nature of the study was explained, and theparents who agreed to enter the study with data from their children sent an electronic questionnaire to the researchers. All positive cases with skin lesions were evaluated by physical examination at the institution at a scheduled time and date.

Avoidance of bias

To guarantee the reliability of the information, the researchers were trained in data collection. A double checklist was used to include all cases. The datawere validated and curated by the principal investigators. To avoid possible interviewer, information, and memory biases, the leading investigator kept the data at all times with a guide and appropriate records. Observation and selection bias was avoided by applying the participant selection criteria.

Statistical method

A descriptive analysis was performed with summary and dispersion measures: mean and standard deviation for scale variables and frequency and percentage for categorical variables. An association analysis with odds ratio (OR), 95% confidence interval, Pearson's

chi-square, and the *P value* is presented. The statistical package SPSS v.25 (Armonk, NY: IBM Corp.) was used for statistical analysis.

Results

The study included 175 schoolchildren.

General characteristics

A total of 175 children were studied, 104 men (59.4%) and 71 women (40.6%). A total of 28 cases (16.0%) corresponded to cases of atopic dermatitis, 18 cases were atypical dermatitis (64.3%), and 10 cases (35.7%) corresponded to typical atopic dermatitis. Pediatricians made the diagnosis in 7 cases (25%), dermatologists in 8 cases (28.6%), and allergists in 2 cases (7.1%). Tables 1 and 2 show the frequencies according tothe diagnostic criteria of atopic dermatitis lesions; in 60% of the cases, there were no active lesions.

Table 1. Frequencies according to diagnostic criteria

		Frequency	Percentage
Type frominjury to thetestphysical	Without injuriesactive	17	60.70%
	injuriesacute	5	17.90%
	injuriesChronicles	4	14.30%
	injuriessubacute	2	7.10%
Descriptionpruritus	Predominancenight	12	42.90%
	Withoutspecific time	16	57.10%
Intolerancea food	Additivesfood/dyes	8	28.60%
	Protein from the milk, egg	3	10.70%
	Shrimp	2	7.10%
	Nopresents	15	53.60%

Table 2. Frequencies according to diagnostic criteria.

	Frequency	Percentage
Dermatitischronicleeither relapsing	28	100%
Xerosis	26	92.90%
Cheilitis	25	89.30%
PityriasisSunrise	22	78.60%
Conjunctivitisrecurrent	22	78.60%
KeratosisPilaris	20	71.40%
Intoleranceof the wool	16	57.10%
Pruritusto thetranspire	12	42.90%
Typical morphology in suede foldsulnar and popliteal fossa	8	28.60%
Darkeningorbital	6	21.40%
Dermatitisunspecificfrom handsY feet	5	17.90%
Dennie's infraorbital foldMorgan	2	7.10%
Erythema/	2	7.10%
Pallor facial	2	7.10%

Within the absolute frequency, the patients had additional dermatitis as accompanying symptoms of xerosis, cheilitis, pityriasis alba, conjunctivitis, keratosis, and intolerance to wool in >50% of the cases (Table2).

Bivariate analysis

All the variables were compared between the groups. The history of AD in the father, the history of AD in the mother, the diagnosis of asthma in the father, and concurrent rhinitis in the child, diagnosis of rhinitis in the father, exposure to tobacco at home,history of rhinitis in the mother, and the formation of small families were established as risk factors for the development of AD in order of impact. Large families constituted a protective factor (Table 3).

Discussion

When collecting the information from the applied surveys and the evaluation by a physical examination in the boys and girls of the Santo Tomás de Apóstol Educational Unit in 3 months, a sample of 175 students was determined, of which 28 presented the disease (Dermatitis atopic).

When the diagnosis of the disease was made in a community setting, the 28 individuals presented characteristics compatible with AD of mild to moderate intensity according to the lesions presented during the physical examination, and60.7% of the individuals presented complete remission of the lesions during the physical examination.

The diagnosis of AD should be based on the physical examination or characteristic signs of the skin, a history of aggravating factors (chemical or environmental), and hereditary history of allergic diseases of the atopic spectrum, since at the time of the physical examination there may not be an outbreak [5], this is associated with climate changes or exposure to other agents, which iswhy he recommends that in order to make a diagnosis with greater certainty, patients should be evaluated twice a year where there is a difference in climate to verify the moments of outbreak.

There are several risk factors that predisposepatients to the development of AD, which gives it multifactorial characteristics, thus unifying different conditions such as familial atopy (OR: 2.39,*P* <0.001). Another reported factor has been female sex [6], which was not significant inthis study.

Table 3. Association analysis of risk factors for the presence of Atopic Dermatitis

Variable	Dermatitis No.=28	Without dermatitis 147	OR	95% CI	*P*
AD in father	5 (17.9%)	1 (0.7%)	31.739	3.546–284.060	0.0020
AD in the mother	8 (26.6%)	6 (4.1%)	9.400	2.954–29.910	<0.0001
asthma in father	4 (14.3%)	5 (3.4%)	4.7333	1.186–18.893	0.0277
concurrent rhinitis	8 (28.6%)	12 (8.2%)	4.500	1.6384–12.360	0.0035
Allergic rhinitis in the father	10 (35.7%)	18(12.2%)	3.9815	1.592–9.960	0.0031
Exposure to tobacco in the home	7 (25.0%)	12 (8.2%)	3.750	1.326–10.603	0.009
Allergic rhinitis in the mother	11 (39.3%)	29 (19.7%)	2.633	1.1137–6.224	0.0274
Small Vs. Medium/Large Family	16 (57.1%)	50 (34.0%)	2.5867	1.1363–5.8883	0.0235
Large vs. small/medium family	0 (0%)	10 (6.8%)	0.0220	0.0013–0.3649	0.0077
male sex	17 (60.7%)	87 (59.2%)	1.066	0.46–2.44	0.88
Age 5–6 years Vs. 7–8 years	13 (46.4%)	76 (51.7%)	0.810	0.36–1.82	0.609
asthma in the mother	1 (3.6%)	5 (3.4%)	1.052	0.1189–9.362	0.9638
concurrent asthma	2 (7.1%)	3 (2.0%)	3.7179	0.5921–23.347	0.1612
Exposure to tobacco in pregnancy	3 (10.7%)	13 (8.8%)	1.237	0.328–4.658	0.753
exclusive breastfeeding	9 (32.1%)	75 (51.0%)	0.455	0.193–1.071	0.067
Living with pets	11 (39.3%)	87 (59.2%)	0.446	0.195–1.020	0.052
Daily Grooming Vs. Infrequent Grooming	27 (96.4%)	143 (97.3%)	0.755	0.081–7.021	0.804
Education 1st grade vs. 2–3	11 (39.3%)	44 (29.9%)	1.5174	0.656–3.4965	0.3306
Education 3rd grade vs. 1–2 grade	13 (46.4%)	49 (33.3%)	1.7333	0.765–3.9279	0.1875
Education of the mother Primary Vs. secondary or higher	1 (3.6%)	9 (6.1%)	0.5679	0.069–4.669	0.5986
Mother's education Higher Vs. primary or secondary	11 (39.3%)	39 (26.5%)	1.7919	0.7794–4.1597	0.1747
Parent's Education Primary Vs. Secondary or Higher	0 (0%)	2 (1.4%)28	1.0211	0.0477–21.8387	0.9894
Parent's Education Higher Vs. Primary or Secondary	11 (39.3%)	52 (35.4%)	1.1821	0.5153–2.7120	0.6929
Urban Vs. Rural Residence	28 (100%)	130 (88.4%)	7.437	0.4465–130.8585	0.1605

AD: Atopic dermatitis

The present study determined that the percentage prevalence is higher in the male sex, with a value of 60.7%; however, these numerical data are not statistically significant, which differs from the study above.

It should be mentioned that the association between the prevalence of the disease and the age of the cases exposed to AD cannot be found in statistical inference to determine that it is a risk factor in the development of the study pathology since when validated by test chi-square statistic, a value $P = 0.609$ is found.

Another riskfactor mentioned is exposure to contact with pets during the first year of life (OR: 3.148 *P*, <0.001), and after seven years of age (OR: 1.48, *P* =0.027), it is a risk factor for the development of AD[7][, which in this study was not significant with a slight tendency toward a protective factor. Larger samples will be required in the future to confirm this hypothesis.

A risk factor within the maternal history is exposure to smoking during pregnancy, which has been shown to have no statistical inference in children who develop atopic dermatitis, as has the history of socioeconomic status [8].

The information from the bibliographical reference mentioned above contrasts with the data obtained in the present study, where no association was found between tobacco consumption in pregnancy and the disease, with a value of $P = 0.753$, which was not statistically significant.We analyzed the educational level of the father and mother with values of $P = 0.777$ and $P = 0.372$, respectively, for each one, without finding a significant association.

A study reported in Shanghai, China (2016),reported that there is a higher prevalence of children who developed atopic dermatitis when they had a history in parents who had renovated furniture in the home during the prenatal period, in addition to presenting the same condition in children who lived in urban areas (OR: 1.5, 1.9, $P < 0.05$) [9], which this study was insignificant.

Within the limitations of the present study, it can be observed that all the disease cases are concentrated in urban parishes, which does not allow for determining an association between the type of residence and the pathology.

Although the association of passive smoking and the development of atopic dermatitis in children is not shown to be a risk factor with statistical inference in the

bibliographical references, our study shows that children exposed to passive smoking in childhood are 3.7 times more likely to develop the disease than participants who were not exposed.

In a study carried out in Shanghai in 2010, it was determined that the history of parents who developed atopic dermatitis, asthma, and allergic rhinitis predisposed the disease to occur in their chlidren, expressing an OR 8.5 and 13.3 times more, respectively[9].

When carrying out the statistical analysis of the family history for the development of Atopic Dermatitis, it was found that there is a statistically significant inference ($P < 0.0001$), affirming what the study carried out in Shanghai mentions, finding a higher percentage value in the parents of the children than in mothers (10.819 and 5.278). It is also worth mentioning that if there is a family history of Alelrgic Rhinitis, the risk of suffering from the pathology under study increases.

In 2019, a study was carried out in the United Kingdom with a sample of 4938 cases of atopic dermatitis, evaluating among the secondary results that asthma and allergic rhinitis were risk factors for the development of the disease with a statistical value $P < 0.001$ [10].

After analyzing the study participants' personal history, the bibliographic reference mentionswere reaffirmed since a statistically significant *P value <0.001 was found.* It is worth mentioning that a history ofallergic rhinitis increases the possibility of developing atopic dermatitis4.5 times.

When comparing the children who presentedwith atopic dermatitis with a history of breastfeeding, a percentage difference (67.9%) was found, which shows that exclusive breastfeeding decreased the probability of developing the pathology; however, these percentage values were not statistically significant when applying the chi-square test, which shows that there is no association between the variables.

Another study showed that factors associated with the hygiene hypothesis, such as daycare attendance and the number of family members, are not associated with a decreased risk of developing AD[11].

According to the association of the number of family members and atopic dermatitis, it was found that the risk of presenting the pathology is 2.5 times higher in small families, while belonging to larger families becomes a protective factor; these values are statistically significant. The explanations for this phenomenon still need to be fully understood; they could be associated with immunological tolerance in herds in communities, which does not occur in small and isolated groups.

Finally, this study presented similar findings to other studies referring to AD risk factors, such as positive family history and individual atopy, which constitutes the leading risk factor found in this study. However, it is essential to note that many environmental risk factors presented in the bibliographical references as risk factors for AD in this study did not have a statistical association, probably due to a larger sample size and clinical characteristics that can be used for future sutdies.

Conclusions

A total of 14.2% of school children presented AD. Risk factors for AD development were a history of asthma, allergic rhinitis, and AD in the parents, exposure to tobacco at home, and the diagnosis of concurrent rhinitis in the child. Large families became a protective factor.

Abbreviations

AD: atopic dermatitis.
OR: Odds Ratio.

Supplementary information

No supplementary materials are declared.

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Author contributions

Paola Belén Guambo Heredia: Conceptualization, Data conservation, Acquisition of funds, Research, Resources, Software, Writing- original draft.
Luz María Dressendörfer Garcés: Conceptualization, Data conservation, Supervision, Acquisition of funds, Research, Resources.
All authors read and approved the final version of the manuscript.

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Availability of data and materials

The data sets generated and/or analyzed during the current study are not publicly available due to participant confidentiality but are available through the corresponding author upon reasonable scholarly request.

Statements

Ethics committee approval and consent to participate

It was not required for an observational study.

Publication Consent

This does not apply to studies that do not publish MRI/CT/Rx images or physical examination photographs.

Conflicts of interest

The authors declare they have no conflicts of interest.

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