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A rural environment does not protect against asthma or other allergic diseases amongst Mexican children

M. Bedolla-Barajas^{a,*}, F. Javier Ramírez-Cervantes^b, J. Morales-Romero^c,
J. Jesús Pérez-Molina^d, C. Meza-López^d, N. Delgado-Figueroa^d

^a Servicio de Alergia e Inmunología Clínica, Hospital Civil de Guadalajara "Dr. Juan I. Menchaca", Salvador de Quevedo y Zubieta No. 750, Colonia La Perla, Guadalajara, Jalisco C.P. 44340, Mexico

^b Centro Universitario de los Altos, Universidad de Guadalajara, Carretera a Yahualica km. 7.5, Tepatitlán de Morelos, Jalisco C.P. 47630, Mexico

^c Instituto de Salud Pública, Universidad Veracruzana, Av. Luis Castelazo Ayala s/n., Colonia Industrial Ánimas, Xalapa, Veracruz C.P. 91190, Mexico

^d División de Pediatría, Hospital Civil de Guadalajara "Dr. Juan I. Menchaca", Salvador de Quevedo y Zubieta No. 750, Colonia La Perla, Guadalajara, Jalisco C.P. 44340, Mexico

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KEYWORDS

Asthma;
Children;
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Abstract

Introduction: The commonly held notion that a rural environment decreases the frequency of allergic diseases has proven to be inconsistent amongst children.

Objective: Our objective was to contrast the prevalence of bronchial asthma (BA), allergic rhinitis (AR), and atopic dermatitis (AD) between children that live in a rural environment and those that live in urban areas.

Methods: We carried out a cross-sectional study amongst children aged six to seven; they were selected through probabilistic, stratified and conglomerated sampling. The prevalence of BA, AR, and AD was identified with the use of the questionnaire provided by *The International Study of Asthma and Allergies in Childhood*, additionally, we inquired about each child's family history of atopy, their exposure to farm animals, the intake of unpasteurised cow's milk, and the number of siblings related to every child. We used logistic regression and multivariate analysis to determine the correlation between asthma, allergic diseases, and rural environment.

Results: We included 189/1003 (18.8%) children from a rural environment, and 814/1003 (81.2%) from an urban area. BA and AR were associated to a family history of atopy (OR = 2.15, $p=0.001$; OR = 2.58, $p=0.002$, respectively). BA was more prevalent in males (OR = 1.92, $p=0.007$). Notably, a higher number of siblings seems to protect against AR (OR = 0.45, $p=0.008$). A paternal history of allergies was associated to AD.

* Corresponding author.

E-mail address: drmbedbar@gmail.com (M. Bedolla-Barajas).

Conclusions: In our study, we were unable to find protective factors in a rural environment that might decrease the prevalence of asthma or allergic diseases.

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Introduction

Urbanisation, along with heritage,^{1,2} has been associated to an increasing prevalence of asthma, allergic rhinitis, and dermatitis around various parts of the world.^{3,4} Some have argued that increased standards in hygiene and smaller nuclear families have contributed to this pattern.⁵ Interestingly, this prevalence has not been observed in rural areas; the following rural conditions have been linked to potential protective agents that act against these diseases: a greater number of siblings,^{1,6} sex,² breastfeeding,^{7,8} type of delivery,⁹⁻¹³ interaction with farm animals,^{14,15} and the intake of unpasteurised cow's milk, amongst other.¹⁶⁻¹⁸

The effect that a rural environment might have on the frequency of asthma, allergic rhinitis, and atopic dermatitis has seldom been researched in Mexico,^{19,20} thus we decided to study the matter, in order to do so, we contrasted the prevalence of these diseases amongst school-aged children that live in an urban setting to those that live in rural regions. Additionally, we attempted to determine which, if any, rural factors act as protective agents against these diseases.

Methods

Ethics

This study was approved by the Ethics Committee at The Hospital Civil de Guadalajara "Dr. Juan I. Menchaca" and ratified by *La Jurisdicción Sanitaria No. III Altos Sur de la Secretaría de Salud de Jalisco*, as well as by the board of directors in The *Delegación Regional de Servicios Educativos*. In order for children to participate in our study, a legal guardian had to sign a written consent form.

Setting

Tepatitlán de Morelos is located in western Mexico, at an altitude of 1806 metres above sea level; it encompasses an area of 1532.78 km² in which approximately 141,322 inhabitants reside.²¹ We selected this region because within its limits, it is possible to study both a rural and an urban population simultaneously.

Design

Our cross-sectional study was population based, the candidate selection process took place from April 2012 to April 2013, our subjects were primary school (both public and private sectors) students, aged six to seven. The universe of study was of 3946 children.

Sample size

We estimated a sample size of 848 school-aged children, plus a 20% increase due to potential non-response, we also considered a confidence interval at 95%, a statistical power of 80% and a higher proportion of children with asthma in an urban setting (12%) over those in a rural environment (7%).

Pilot study

We carried out a pilot study to identify potential errors in our questionnaire, inexperienced interviewers, and any inadequacies in the selection of our test subjects. The test subjects selected for the pilot were not included in the final analysis.

Techniques and sampling

Our sample selection was probabilistic, stratified and clustered, as seen previously in similar studies.²²

We selected regions that had both rural and urban schools that were certified by Jalisco's Department of Education. The calculated sample was assigned proportionally into a rural or urban group, 17% and 83%, respectively. Each school zone was considered a stratum that contributed with a certain number of schools; they were selected through random numbers generated by a computer. The total number of schools per stratum was decided upon after we multiplied the percentage of students that each school zone contributed by the number of schools in each region, respectively; the obtained result was rounded to the nearest superior whole number. After selecting the schools, each grade was assigned to its own stratum that contributed proportionally to the calculated sample; when the number of selected schools did not reach the calculated sub-sample, we continued to randomly select schools until there were enough.

Procedure

Once we identified potential test subjects, we explained the general objective and implications of our study to each individual; additionally, we received verbal consent from the primary school teachers and a signed consent form from a legal guardian.

Measurements

The prevalence of asthma and allergic diseases was determined with the use of a questionnaire that has been

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