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RESEARCH ARTICLE





Frequency of self-reported allergies at a high-complexity referral hospital in Colombia, a tropical Latin American country

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KEYWORDS

allergic rhinitis; asthma; drug allergy; food allergy; tropics

Abstract

Background: The frequency of allergic diseases in tropical Latin American populations is poorly understood, and certain particularities can impact their natural history and risk factors. Objective: The study aimed to determine the frequency of self-reported allergies (allergic diseases, drug, and food allergies) in patients who attended the Hospital Universitario Fundación Santa Fe de Bogotá, Colombia.

Material and methods: A retrospective study was conducted to assess the frequency of self-reported allergies reported by all the patients who attended an allergy referral center between June and December 2019.

Results: A total of 60978 patients were included. Allergic rhinitis was reported by 1.51% (n=921), asthma by 1.28% (n=782), and atopic dermatitis by 0.41% (n=250) of the study population. A higher frequency of self-reported allergic diseases (rhinitis, asthma, and dermatitis) was found in the younger populations, while drug allergies were more frequently reported in adults. The most frequently self-reported drug allergies were penicillin allergy (4.07%, n=2479), and non-steroidal anti-inflammatory drug (NSAID) allergy (1.85%, n=1116). The most commonly reported food allergens included shellfish (0.58%), fruits (0.54%), cow's milk protein (0.37%), and eggs (0.21%). Conclusion: The distribution of food allergens showed a higher frequency of shrimp and fruit

allergies compared to previous studies on African, Asian, and Arabic tropical populations that describe a higher predominance of egg and milk allergies. Patients reporting allergic diseases should always be referred to the allergology department for confirmatory testing.

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Introduction

The prevalence of allergic diseases has significantly increased worldwide during the last three decades, particularly in low-/middle-income countries.¹ Indeed, in tropical regions of Latin America the incidence of allergic diseases could be even higher due to certain particularities that influence the natural history and risk/protective factors of these diseases.¹ However, allergic diseases have been poorly understood in most of low-/middle-income tropical countries, and the treatment guidelines are based on high-income European and North American populations.

In spite of self-perception of allergic disease being the starting point that leads to confirmatory diagnosis,2 few studies have been conducted about self-reported allergic diseases in tropical Latin American populations.3 Moreover, these studies have been mostly focused on pediatric population. During 2010, the prevalence of self-reported asthma, allergic rhinitis, and atopic dermatitis in Colombia were 12% (95% confidence interval [CI]: 10.5-13.7), 32% (95% CI: 29.5-33.9), and 14% (95% CI: 12.5-15.3), respectively.4 There has been only one study in Colombia on the prevalence of self-reported food allergy in a tropical population from Cartagena, reporting a prevalence of 6.6-10% in adults and a confirmed prevalence of 5.3%.5 To date, in English literature, no information is available about the frequency of self-reported drug allergies in Colombia. The frequency of self-reported allergies in Latin American tropical populations could provide preliminary information about the epidemiology of these diseases and the distribution of allergens in these particular environments. This study aimed to determine the frequency of self-reported allergies by patients who attended the Hospital Universitario Fundación Santa Fe de Bogotá, an allergy referral institution located in Colombia, a tropical Latin American country.

Methods

Study design

A retrospective, observational, descriptive study was performed. The study aimed to assess the frequency of self-reported allergies in all the patients who attended the emergency department, hospitalization (inpatient care), ambulatory care (outpatient care), and priority care at the Hospital Universitario Fundación Santa Fe de Bogotá (FSFB) between June 1, 2019 and December 31, 2019. The FSFB is a highly complex academic medical center providing access to all medical specialties and is a referral center for allergy patients from all over the country. The study was approved by the Ethics Committee of the FSFB (CCEI-8808-2018, December 17, 2018) according to the Helsinki Declaration.

Participants and data

The inclusion criteria were as follows: pediatric or adult patients who had attended the FSFB and reported any type of allergies as a primary or secondary diagnosis in their medical records. Patients that did not clearly specify the

type of allergic disease were excluded. Overall, 124619 consultations with allergy records were revised, and after removal of duplicate entries, 60978 patients were identified and included in the analysis. The information was provided by the Center for Health Studies and Research of the FSFB, and retrieved from the hospital information system (ISIS) software. Information about sociodemographic characteristics and the type of allergy and allergens (allergy triggers) was also extracted from the hospital information system.

Statistical analysis

Statistical analysis was performed using Stata 16MP and R 3.6.1 software. Absolute and relative frequencies and percentages were reported for qualitative variables. Central tendency and dispersion measures were estimated for quantitative variables. A stratified analysis based on the age group of different types of self-reported allergies was conducted. Finally, a multiple correspondence analysis (MCA) was performed to describe joint relationships of the most frequent allergies considering the age group and the type of healthcare setting they had attended (emergency department, outpatient care, inpatient care, and priority care).

Results

A total of 60978 patients were included. Table 1 shows the baseline sociodemographic characteristics of the study population and the frequency of self-reported allergies. Only 9% patients reported allergies to any medication, and the most frequent allergen medications were penicillin, penicillin derivates, aspirin, and non-steroidal anti-inflammatory drugs (NSAIDs). About 2.15% of the population reported any kind of food allergy, and the most frequent allergens included shellfish, fruits, cow's milk, and eggs.

The analysis of self-reported allergies stratified by age group is shown in Figure 1. The frequency of asthma, allergic rhinitis, and atopic dermatitis decreased with aging, while the frequency of drug allergy increased in older age groups. In the <5-year-old group, the most frequent allergic disease was asthma (6.7%), while subjects aged between 5 and 18 years primarily reported allergic rhinitis (5.3-5.9%). Penicillin allergy was most frequently reported in adults aged more than 40 years.

Overall, the frequency of self-reported allergies was similar between males and females. Table 2 shows a stratified analysis of the frequency of food allergies by age group. A higher frequency of cow milk and egg allergies were determined in children aged <5 years, while shellfish, fruits, fish, and pork allergies were generally reported in adults aged more than 40 years.

Multiple correspondence analysis: joint characteristics of self-reported asthma, rhinitis, dermatitis, and penicillin allergies

Figure 2 shows the MCA among the type of self-reported allergy, the age group, and the type of healthcare setting

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Variables	n=60978	%
Gender (F/M) ^a	35100/25878	57.56/42.44
Age (in years)	39.38 (23.31) ^b	38.41 (1-99)
Age group		
<5-year old	5467	8.97
5 to <9-year old	2347	3.85
9 to <18-year old	4953	8.12
18 to <40-year old	19172	31.44
≥40-year old	29040	47.62
Healthcare setting		
Emergency department	26385	43.27
Outpatient and priority	24342	39.92
care clinic services		
Inpatient care	10251	16.81
Frequency of self-reported	lallergies	
Allergic disease		
Allergic rhinitis	921	1.51
Asthma	782	1.28
Atopic dermatitis	250	0.41
Urticaria/angioedema	43	0.07
Drug allergies		
Penicillin and derivates	2479	4.07
Aspirin or NSAIDs	1126	1.85
Other antibiotics	997	1.63
Opioids	749	1.23
Contrast agents	147	0.24
Anesthetics	37	0.06
Food allergy		
Shellfish	352	0.58
Fruits	331	0.54
Cow's milk	228	0.37
Nuts and dry fruit	127	0.21
Egg	126	0.21
Fish	81	0.13
Pork	65	0.11
Other allergies		
Latex	72	0.12

^bValues are expressed as mean (SD)

patients had attended. The spheres shaped in the spatial distribution show associations between categorical variables. The variables that are closer to each other in the MCA show significant statistical associations between them: asthma was most often reported in children aged less than 5 years, and these patients frequently attended the emergency and inpatient care services; allergic rhinitis and atopic dermatitis were often reported by patients aged 13-60 years, and they attended outpatient and priority care clinic services; penicillin allergy was primarily reported by patients aged more than 60 years.

Discussion

The frequency of allergic diseases found in this study was similar to the prior research conducted in middle-income

tropical Asian countries that described an inverse relationship between allergic diseases and aging.6 The frequency of asthma in children aged 1-9 years was higher (6.7%) compared to adults aged 18-40 years (2.1%). The prevalence of asthma could be similar to as found in low-/middle-income countries such as Pakistan (8%). Bangladesh (7.3%), and India (7%), but it could be lower as compared to high-income countries such as Australia, New Zealand (30%), the United Kingdom (29%), and the United States (21%).6 Overall, a higher prevalence of allergic diseases has been described in high-income countries compared to low-middle countries of Latin America, Asia, and Africa. This could be explained by methodological differences. However, studies conducted in similar African and Latin American populations have reported a lower incidence of allergic diseases, probably because of early exposure to farm animals and parasitic infections that modulate allergic inflammatory responses. Furthermore, rhinitis, atopic dermatitis, asthma, and urticaria/angioedema are not necessarily allergic until a confirmatory study is conducted or professional approach to manage these allergies is undertaken. Self-reported diagnosis of allergic diseases only provides preliminary epidemiologic information, and this is an important limitation of this study. Studies with stronger methodologies must be conducted in Latin American populations.

Penicillin allergy was the most common drug allergy, followed by NSAIDs and aspirin allergies; this is similar to previous reports of low-income African tropical countries.² The MCA showed that penicillin allergy was more frequently found in adults aged more than 40 years in hospitalization or inpatient settings. Moreover, our findings provide a directly proportional relationship between drug allergies and aging. Previous studies have put forward that increased consumption of medications could lead to changes in cytokine phenotype in older populations, making them more susceptible to allergic manifestations.8 Therefore, our results have biological plausibility. However, the term "drug allergy" is frequently mistaken with adverse drug reactions and nonallergic conditions, leading to therapy modifications that could increase the treatment cost and have negative clinical repercussions.2 Our study highlights the importance of referring these patients to allergy/ immunology departments for confirmatory tests.

Regarding food allergies, the most frequently encountered allergens in this study were fruits, shellfish, and cow's milk protein. Similarly, previous authors have reported that sensitization to shrimp and fruits is more frequent than eggs and milk in tropical Latin American countries.3 Conversely, in tropical Australian, African, and Arabic populations, milk and eggs are the most frequent allergens.3 This scenario highlights the requirement for research on food allergies with focus on populations with higher exposure to tropical allergens such as tropical fruits. In Cartagena, a city located on the northern Caribbean coast of Colombia, the most frequently reported foods are fruits (41.8%), seafood (26.6%), and meat (20.8%).5 In our study conducted in Bogotá, the primary Colombian city located in a montane savanna, the most frequent allergens were shellfish (0.73%), fruits (0.54%), and cow's milk protein (0.37%). Therefore, these differences could be related to environmental factors such as the geographic distribution of allergens, climate factors that interact with the immune

cValues are expressed as median (range).

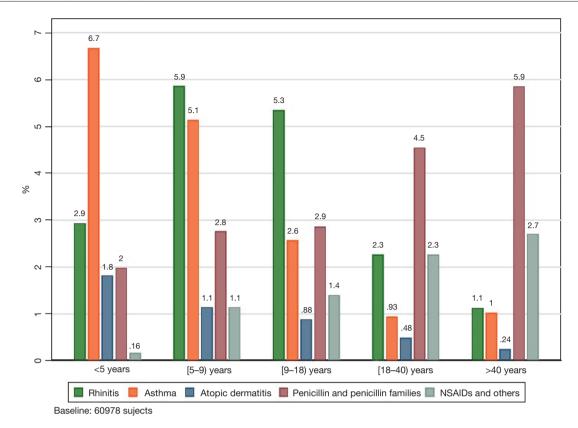


Figure 1 Type of most frequently self-reported allergies based on age group. Square brackets [] mean the end of range is inclusive or includes the mentioned age. Parentheses () mean the end is exclusive and does not contain the mentioned age.

	Shellfish	Fruit	Cow's milk	Nuts and dry fruits	Egg	Fish	Pork
Age group	n (%) ^a	n (%) ^a	n (%)ª	n (%)ª	n (%) ^a	n (%)ª	n (%)ª
<5-year old	10 (2.84)	41 (12.39)	144 (63.16)	16 (12.60)	72 (57.14)	13 (16.05)	4 (6.15)
5 to <9-year old	19 (5.40)	45 (13.60)	23 (10.09)	20 (15.75)	18 (14.29)	14 (17.28)	6 (9.23)
9 to <18-year old	25 (7.10)	61 (18.43)	23 (10.09)	27 (21.26)	18 (14.29)	9 (11.11)	13 (20.00)
18 to <40-year old	118 (33.52)	83 (25.08)	15 (6.58)	37 (29.13)	9 (7.14)	18 (22.22)	21 (32.31)
>40-year old	180 (51.14)	101 (30.51)	23 (10.09)	27 (21.26)	9 (7.14)	27 (33.33)	21 (32.31)
Total	352	331	228	127	126	81	65
Proportion of allergic patients ^a	0.58%	0.54%	0.37%	0.21%	0.21%	0.13%	0.11%

system in the early stages of life, and lifestyle dietary differences. On the other hand, a wide variety of foods could prompt or aggravate skin diseases, such as contact dermatitis, urticaria, or atopic dermatitis, for which appropriate diagnostic tests are essential. Thus, implementing clinically useful tools, such as atopy patch tests, for assessing delayed-type reactions to protein allergens in different healthcare environments could be useful to detect protein allergens relevant for certain skin diseases. Hence, studies using these tools are required.

Strengths of this study include the sample size, which was quite large compared to previous Latin American studies conducted on self-reported allergies. About the limitations of this study, the criteria to assess the frequency

of allergic diseases were not based on clinical guideline-validated diagnosis but primarily on information from self-reported cases. Self-reported data could be strongly affected by reporter bias and overestimation of the true frequencies of diseases. These data could also exclude information about immunoglobulin E (IgE)-mediated and non-immunological disorders. Thus, we emphasize that patients reporting some type of allergy should be referred to allergy/immunology services for confirmatory diagnosis. Among additional limitations of this study, up to 60.1% patients attended the emergency department and priority care services, which are exceedingly demanding areas of medical care. This scenario could result in high rates of underreporting of allergies. However, the institution that

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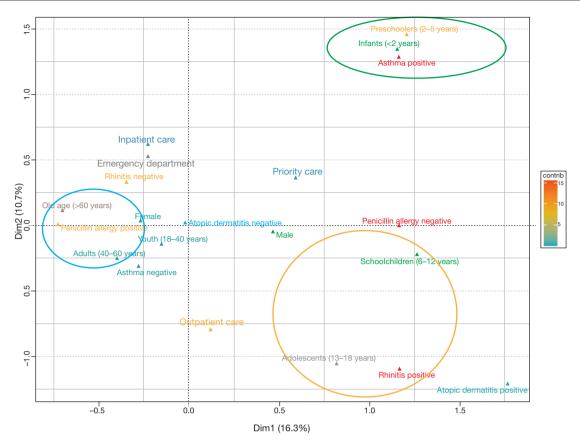


Figure 2 Multiple correspondence analysis of the most frequent allergies (allergic rhinitis, asthma, atopic dermatitis, and penicillin allergy). The distribution of variables formed by the axes Dim1 and Dim2 is shown. From this structure of relations, two groups could be clearly observed (designated in an *ad hoc* manner in the diagram considering colors to ease their identification).

provided data has a robust computer infrastructure and standardized information collection processes.

Conclusion

The frequency of self-reported allergic diseases described in this study was lower compared to previous studies conducted in high-income countries but similar to low-/middle-income tropical countries. The distribution of food allergens showed a higher frequency of shrimp and fruits allergies compared to previous studies conducted on tropical populations having a predominance of egg and milk allergies. Patients reporting some type of allergy must be referred to allergy/immunology services for confirmatory tests, proper diagnosis, treatment, and follow-up.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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