

# Prevalence of self-reported food allergy in Cartagena (Colombia) population

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## ABSTRACT

*Background:* Food allergy (FA) is an important health problem in western societies; however, there are no data available from developing countries. Studies based on self-reported symptoms range from 1.4 % to 33 %, and it is supposed that FA is more prevalent early in life. To our knowledge in Latin America there has not been a report on prevalence estimates for food allergy in unselected population-based studies.

*Objectives:* The aim of this study was to determine the prevalence of self-reported food allergy, the most frequent symptoms, the allergens, and the risk factors for FA in a population from Cartagena (Colombia).

*Methods:* This is a cross-sectional study. A total of 3099 (55.4 % Female, and 44.6 % Male) individuals in a randomised selection, aged 1-83 years, living in neighbourhoods in Cartagena, were asked questions about personal and family history of allergies and food allergy.

*Results:* The overall prevalence of self-reported FA was 14.9 % (Total 461 subjects, 16.4 % female,

12.8 % male). Fruit/vegetables (41.8 %), seafood (26.6 %), and meats (20.8 %), were the most reported allergens. The most frequently reported symptoms were skin (61.4 %), gastrointestinal (29.1 %), and respiratory reactions (8.6 %). FA was most frequent in subjects reporting atopic diseases (62.9 % vs. 29.6 %,  $\chi^2$  test,  $p < 0.001$ ).

*Conclusions:* Self-reported FA was determined in Cartagena population. Fruit/vegetables, seafood, and meats were the most reported allergens. Skin and gastrointestinal symptoms were the most frequent manifestation of FA. Our study is the first report on prevalence estimates for food allergy in a Latin American country.

**Key words:** Cross-sectional study. Food hypersensitivity. Prevalence. Questionnaire. Seafood.

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## INTRODUCTION

Food allergy (FA) is a frequent and common health problem; however, there are few population-based studies. Prevalence studies based on self-reported symptoms associated to FA are generally imprecise, ranging from 1.4 % to 33 %<sup>1-5</sup>. The prevalence of FA in the population depends on factors such as eating habits, cultural influences as well as the genetic background and methodologies applied<sup>6-10</sup>. However, few studies have been conducted at the population level. Most researchers suggest that the public's belief in FA is much higher than prevalence data support. However, FA self-perception questionnaire-based studies conducted on a diverse population serve as groundwork for further objective studies<sup>11-16</sup>.

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In the last few years several studies have suggested that the prevalence of FA is increasing<sup>17-19</sup>. A recent meta-analysis enclosing more than fifty studies, showed great heterogeneity in reported FA prevalence among different populations, and concluded that this could be a result of both differences in study design or methodology and populations<sup>20</sup>. The same study recommends that measurements be made using standardised methods, if possible food challenge. Europrevall, a European Union funded integrated project, is the first initiative towards delivering information and tools necessary to undertake such a problem. In order to obtain reliable FA prevalence estimates, standard protocols and questionnaires are used<sup>21,22</sup>. To date there are few studies in developing countries showing the real dimension of FA as a public health issue<sup>23,24</sup>. The present study was carried out on 3099 subjects using a questionnaire. Our objectives were: a) to establish the prevalence of self-perception of FA; b) which were the most important foods implicated; c) the frequency of the most referred symptoms; d) the prevalence in each age range; and e) the most frequent food implicated according with age range.

## METHODS

### Population

This is a cross-sectional study. A total of 3099 individuals in a randomised selection, aged 1-83 years, and living in neighbourhoods in Cartagena were questioned about personal and family history of allergies and food allergy. Ethnically, Cartagena population is defined as a mixture between Caucasoids (Spaniards) and Negroids (Africans) that are named mulattos<sup>25</sup>. The subjects answered a questionnaire applied door-to-door by trained medical students. The sample was calculated according to Cartagena population size, and a proportional scale was used in each neighbourhood related to the number of houses. A pilot test with 50 individuals was carried out in order to validate the questionnaire.

### Questionnaire

The subjects were asked a questionnaire with ten questions in the following order: 1) personal data and occupation; 2) sex and age; 2) personal history of atopic diseases, rhinitis, asthma and eczema; 3) evaluation by allergist; 4) if yes, the result of the test; (5) the use of latex gloves; (6) if yes, tolerance to gloves. The following questions were designed to

detect an allergic reaction after food or drink intake. In the case of positive reply, questions 9 and 10 were designed to establish the characteristics of reactions, and which, and how many foods, are implicated by the subjects.

### Self-reported symptoms classification

We classified the reported symptoms according to affected organs after food intake: 1) skin reactions if individuals reported symptoms, such as rash, itching, and redness; 2) gastrointestinal symptoms if the adverse reactions were vomits or nausea, diarrhoea, and stomach pain; 3) respiratory symptoms, if these were throat tightness, wheezing, coughing, shortness of breath, and nasal congestion; 4) and other symptoms such as headache, itch and swelling of lips or mouth, swelling of face, and anaphylactic shock.

### Statistical analysis

The data obtained were stored in SPSS software version 13. Statistical analysis was performed using descriptive statistics and we carried out a Chi square test to compare groups according to personal history for atopy and FA. A t-student test was done to establish OR with a confidence intervals of 95 %. If  $p < 0.05$  it was considered significant.

## RESULTS

A total of 3099 individuals participated in the survey. Report of food allergy (FA) was 14.9 % ( $n = 461$ ). The prevalence of self-reported FA was higher in females (16.4 %) than in males (12.8 %) ( $p < 0.05$ ). According to the age range, self-reported prevalence in patients from 1-8 years, was 10.1 %; from 9-16 years, 12.6 %; from 17-24 years, 17.5 %; from 25-32 years, 15.8 %; from 33-40 years, 17.4 %; from 41-48 years, 15.6 %; from 49-56 years, 15.4 %; from 57-64 years, 14.1 %; from 65-72 years, 10.3 %; from 73-80 years, 11.9 %; and more than 81 years, 10.5 % (Table I).

Atopic diseases were more frequent in subjects with self-reported FA than in the non self-reported FA (62.9 % vs. 29.6 %, OR 3.97, CI 95 %, 3.21-4.91,  $p < 0.0001$ ). Asthma was present in 15.4 %, rhinitis in 39.3 %, and dermatitis in 13.2 % of patients with self-reported FA (Table II).

The most frequent symptoms reported were skin reactions (61.4 %), gastrointestinal (29.1 %), and respiratory symptoms (8.6 %) (Table III). Fruit and veg-

**Table I**  
The prevalence of self-reported food allergy (FA)  
in Cartagena population

Population	Total sample (N)	Self-reported FA (N [%])
All	3099	461 (14.9)
Sex		
Female	1717	282 (16.4)*
Male	1382	178 (12.8)*
Age (years)		
1-8	334	34 (10.1)
9-16	450	57 (12.6)
17-24	657	115 (17.5)
25-32	335	53 (15.8)
33-40	345	60 (17.4)
41-48	352	55 (15.6)
49-56	310	48 (15.4)
57-64	149	21 (14.1)
65-72	106	11 (10.3)
73-80	42	5 (11.9)
> 81	19	2 (10.5)

OR 1.33, CI 95 % (1.08-1.64),  $p < 0.05$

**Table II**  
Atopic diseases in subjects with self-reported  
food allergy (FA) vs. without self-reported food allergy

Subjects	N	Asthma (%)	Rhinitis (%)	Dermatitis (%)	Atopic disease (%)
With self-reported FA	461	15.4*	39.3*	18.9*	62.9*
Sex					
Female	283	14.8	44.5	21.6	68.2
Male	178	16.3	30.9	14.6	54.5
Without self-reported FA	2638	7.1	20.1	6.0	29.6
Sex					
Female	1434	7.0	21.4	7.0	31.6
Male	1204	7.1	18.4	7.1	27.3

\* $\chi^2$  test,  $p < 0.0001$ .

ables were the most implicated foods (41.86 %) followed by seafood with 26.8 % and meats with 20.86 % (Table IV). The relative frequency of responsible foods by age showed that fruit and vegetables were the most reported food allergen in almost all age ranges, except in the age range of 9-16 years (Table V). The prevalence of self-reported reactions to fruits and vegetables according to age shows that they are important contributors to the overall prevalence in all age ranges (Table VI).

**Table III**  
Most frequent symptoms in subjects  
with self-reported food allergy (FA) (n = 461)

Reported symptoms	N	%
Skin reactions (Rash, itching, redness)	283	61.4
Gastrointestinal symptoms (Vomiting or nausea, diarrhoea, stomach pain)	134	29.1
Respiratory symptoms (Throat tightness, wheezing, coughing, shortness of breath, nasal congestion)	24	8.6
Headache (Migraine)	40	8.6
Itchy and swelling of lips, or mouth	22	4.7
Swelling of face	8	1.7
Anaphylactic shock	1	0.2
Others	5	1.1

**Table IV**  
Most frequent foods reported as responsible  
for allergy symptoms (N = 461)

Food	N	%
Fruit/vegetables	193	41.86
Seafood	123	26.68
Meats	96	20.86
Liquors	60	13.01
Milk	44	9.54
Eggs	14	3.03
Preservatives/additives	13	2.81

## DISCUSSION

The majority of studies related to FA have been carried out in European countries; to our knowledge, this is the first publication of a population-based study on FA in a Latin American country. In Colombia we do not have any epidemiological data related to this issue. This study is the first step in the knowledge about food allergy in order to identify if this condition is a public health problem in developing countries. The self-reported prevalence of FA was 14.9 %, which was higher in females than in males (16.4 % vs. 12.8 %). These results agree with other reports that used similar methodologies<sup>3,23</sup>. We believe that our prevalence is overestimated due to difficulties in conducting population-based studies with an objective assessment of FA. However, in a recent meta-analysis, where the authors reviewed fifty-one studies, they observed a high heterogeneity in the prevalence reports, even in studies of different countries following the same methodology<sup>26</sup>. Previous studies have shown less than 50 % of self-reported reactions being con-

**Table V**  
Relative frequency of seven food allergens according to age range

Age range (years)	Relative frequency of foods (%)					
	Vegetables/Fruit	Seafood	Milk	Meats	Egg	Liquors
1 to 8	44.1	2.9	2.5	26.4	2.9	0
9 to 16	26	28	11.1	22.7	5.2	7
17 to 24	45.1	27.7	0.8	19.9	1.7	15.6
25 to 32	33.9	28.2	5.6	20.6	3.7	18.8
33 to 40	38.9	23.3	10	11.6	3.3	16.6
41 to 48	39.4	34.5	3.6	16.2	1.8	16.3
49 to 56	66.6	25	16.6	18.7	0	10.4
57 to 64	72	33.3	4.7	14.2	4.7	4.7
65 to 72	42.8	45.4	18.1	9.1	0	27.2
73 to 80	42.8	42.8	14.2	28.2	14.2	0

**Table VI**  
The prevalence of self-reported plant food allergy in Cartagena population (3099)

Age (years)	N/total	Self-reported prevalence in %
1-8	19/334	5.6
9-16	18/450	4.0
17-24	50/657	7.6
25-32	22/335	6.5
33-40	23/345	6.6
41-48	22/342	6.2
49-56	18/310	5.8
57-64	13/149	8.7
65-72	8/106	7.5
73-> 80	4/61	6.5

firmed when controlled challenges are used<sup>5,11</sup>. The highest prevalence (17.5 %) was found between individuals with ages ranging from 17 to 24 years, an interesting finding considering that the majority of studies report the highest prevalence among children<sup>4,27</sup>. The overall prevalence was higher among adults (> 16 years) than children, possibly due to seldom reported child FA related symptoms by the parents as opposed to frequent adult reporting of their own symptoms. Questionnaire-based prevalence studies could overestimate data, but these are important tools for information about problems. Confirmation of these results will come only from further studies that include objective diagnostic tests.

FA prevalence was found to be more frequent among atopic individuals than in non-atopics (62.9 % vs. 29.6 %,  $p < 0.0001$ ), as previously described by other studies. This result suggests that the atopic

condition could be a risk factor to develop FA. Skin reactions were the most frequent symptoms related by the subjects (61.4 %), as reported in other populations<sup>1,2,28</sup>. A low frequency of anaphylactic shock related to FA was found in our study, in accordance with previous reports, probably due to the scarce reactions to nuts in our population<sup>1,20</sup>.

The most frequently implicated foods were fruit/vegetables with 41.86 % followed by seafood and meats with 26.8 % and 20.8 % respectively. In contradiction with other studies we found that fruit/vegetables were the most frequently related foods among the child population<sup>4,20</sup>, this profile could be due to the eating habits of our population. However, this study was questionnaire-based and reactions could be intoxications and other gastrointestinal conditions, hence these results should be confirmed by objective tests. It is very important to point out that this is the first population based study conducted in Latin America, and one of the first in a developing country. For this reason we conclude that this is the first step towards recognising FA as a public health issue in our population.

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## ANNEX

**UNIVERSIDAD DE CARTAGENA**  
**Instituto de Investigaciones Inmunológicas**  
**"Prevalence of food allergy"**

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N.º \_\_\_\_\_ Address \_\_\_\_\_ Stratum \_\_\_\_\_  
 Name/Surname \_\_\_\_\_ Phone \_\_\_\_\_  
 Job \_\_\_\_\_  
 People in the house: Father \_\_\_ Mother \_\_\_ Son/Daughter(s) \_\_\_  
 Relatives \_\_\_ Others \_\_\_

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## QUESTIONS:

1. Age \_\_\_\_\_ 2. Gender \_\_\_\_\_
  2. Atopic diseases:
  3. Rhinitis \_\_\_ Dermatitis \_\_\_  
 Asthma \_\_\_ Urticaria \_\_\_
  4. Assessed by a specialist in allergy?  
 Yes \_\_\_ No \_\_\_
  5. Tests' results \_\_\_\_\_
  6. Do you use latex gloves?  
 Yes \_\_\_ No \_\_\_
  7. Do you tolerate latex gloves:  
 Yes \_\_\_ No \_\_\_
  8. Do you suffer from allergic reactions  
 after eating foods or drinking beverages?  
 Yes \_\_\_ No \_\_\_
  9. What kind of reactions do you have?  
 Urticaria \_\_\_ Vomits \_\_\_  
 Migraine \_\_\_ Colics \_\_\_  
 Diarrhoea \_\_\_ Other \_\_\_
  10. Which are the responsible foods?  
 \_\_\_\_\_
  11. Do you work in the health area, or food industry  
 or a restaurant? \_\_\_\_\_
  12. Have you ever suffered from drug allergy?  
 Yes \_\_\_ No \_\_\_  
 To which one(s) \_\_\_\_\_
- 

Date of the interview \_\_\_\_\_

Interviewer \_\_\_\_\_