# Self-reported food allergy among older Brazilians: prevalence and clinical characteristics – a study protocol

*Alergia alimentar autodeclarada em idosos no Brasil: prevalência e características clínicas – Protocolo de estudo*

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**ABSTRACT**

In recent decades, there has been a significant increase in the prevalence of food allergies, reaching an estimated frequency of 3% to 8% in adults and even higher in self-reports (from 3% to 35%). However, published data on the prevalence of food allergies among older adults are scarce, and in Brazil they are non-existent. The main objective of this study was to investigate the prevalence of self-reported food allergy among older Brazilians (≥ 60 years). This cross-sectional epidemiological study protocol involves a questionnaire that was developed, standardized, and validated in Portuguese. The investigated aspects will include the foods and symptoms most commonly associated with food allergy in this population. The data will be input into an Excel spreadsheet for statistical analysis. Obtaining this data will allow comparison of the results with previous data and help establish treatment plans for these patients.

**Keywords:** Food hypersensitivity, prevalence, aged, epidemiologic studies.

**RESUMO**

Nas últimas décadas tem se observado um aumento expressivo na prevalência de alergia alimentar (AA), com frequência estimada em adultos de 3% a 8%, sendo ainda mais relevante quando se avalia a AA autodeclarada (variação de 3% a 35%). Entretanto, são poucos os dados publicados sobre a prevalência de AA em idosos, e no Brasil tais dados são inexistentes. O objetivo principal deste protocolo de estudo é conhecer a prevalência de AA auto-declarada em idosos (≥ 60 anos) brasileiros. Trata-se de estudo epidemiológico transversal que utiliza questionário padronizado e validado para a língua portuguesa. Entre os vários aspectos investigados, serão avaliados quais alimentos e sintomas são os mais relacionados à AA nestes indivíduos. Os dados obtidos serão transcritos a planilha Excel para realização da análise estatística. A obtenção dessas informações permitirá compará-las às existentes, assim como estabelecer planos de abordagem destes pacientes.

**Descritores:** Hipersensibilidade alimentar, prevalência, idoso, inquéritos epidemiológicos.

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## Introduction

Recent epidemiological studies suggest that the prevalence of food allergy (FA) is increasing and that the profile of sensitization to foods is subject to geographic influences.[1,2] However, the majority of studies focus on children or young adults, giving the impression that FA does not affect older adults. No studies have been conducted in Brazil investigating FA in the elderly.

The prevalence of allergic diseases in the elderly is currently estimated at 10%, with a tendency to increase over the coming years.[3] It is estimated that 20% of the world population will be considered elderly by 2030.

The phenomena of immunosenescence (which affects both adaptive and innate immunity), micronutrient deficiencies, and reduced gastric acid digestion are possible risk factors for development of FA in the elderly. However, underdiagnosis and, consequently, undertreatment is the rule in this age group, not only for FA, but also for other forms of allergic diseases.[4]

It remains unclear whether the prevalence of FA in the elderly population is similar, higher, or lower than in adults or children. The variable results are caused by the investigative methods used to assess FA frequency in different studies. Self-reported FA prevalence is known to be higher than probable FA, defined by symptoms combined with positive specific IgE assay results and/or confirmed with oral challenge tests.[5] This is clear if we compare two recent European studies of the prevalence of FA in adults. Nwaru et al.[5] describe self-reported FA prevalence in adults varying from 9.5% to 35%, whereas Lyons et al.[6] reported prevalence of probable FA at 0.3% to 5.6%. Similar results were observed in an epidemiological study with adults in general in the community.[7]

However, elderly people with immunomediated reactions to food may have symptoms that are difficult to detect, may by confused with symptoms of other diseases related to age, or may be masked by medications (polypharmacy), which makes underestimation of the FA prevalence in these people more likely.[8]

A Portuguese study developed and validated a written questionnaire for investigation of self-reported FA in adult populations, creating the possibility for its use in other countries where Portuguese is spoken, in addition to working as a screening instrument in investigations of FA.[9]

The present study was motivated by the absence of epidemiological data on FA in the elderly in Brazil and the availability of a previously validated written instrument in Portuguese and its objective is to determine the prevalence of self-reported FA, the foods involved, and the main symptoms.

## Patients and method

Elderly people, over the age of 60 years, regardless of sex, will be invited to take part in this cross-sectional population study with a convenience sampling strategy. These participants will be identified by allergist/immunologist physicians affiliated to the Brazilian Association of Allergy and Immunology (ASBAI) from the 23 Brazilian states in which the ASBAI is active.

Patients will be recruited by the assisting physician during consultations at Allergy and Immunology clinics at public (University Hospitals and health care centers) or private heath care services (whether in clinics or physicians' offices), sequentially and regardless of having symptoms of food allergy.

All of the elderly participants will answer the questionnaire in person. This instrument was developed and validated in Portuguese (from Portugal) by Lozoya-Ibáñez et al.[9] and was assessed and adapted for the Brazilian culture. The data obtained will be transcribed to an excel spreadsheet for later statistical analysis.

## Cross-cultural adaptation of the instrument

Since the original questionnaire was written in Portuguese from Portugal, the translation step was omitted and it only underwent analysis of its adequacy for the cultural context and lifestyle found in the target culture, in Brazil.[10] Therefore, the questionnaire was sent to 25 allergy and immunology specialist physicians from all over Brazil, who were asked about the clarity of the questions and their capacity to differentiate individuals with possible conditions related to FA. Twenty-one of these physicians agreed to assess the questionnaire's adequacy and sent back their observations.

Terms identified as uncommon in the Brazilian culture were substituted for other more appropriate ones and other specific changes were made (for example, regional foods), reaching a final instrument

which will be administered to 10 elderly people to test its comprehensibility (Figure 1).

The following changes were made to the original questionnaire after the specialists' feedback: (a) in question 2, "years of educational level" was changed to "highest educational level achieved by the elderly subject" with the following response options: no education, complete elementary education, incomplete elementary education, complete secondary education, incomplete secondary education, and others, to facilitate comprehension; (b) in question 6, "Which food or foods provoke the reaction (multiple choice MC)?" to "What is the food or foods that provoke your reaction (multiple choice)?"; "seafood or crustaceans, shrimp, crab, lobster, etc." was added in parentheses to the item "mariscos"; "mussels, octopus, squid" was added in parentheses to the item "mollusks"; "other dry fruit" was changed to "dry fruit (cashews, Brazil nuts, almonds, pistachio, hazelnuts, walnuts, etc.)"; foods in the latex group were positioned after dry fruit and "carica papaya" was specified rather than simply "papaya"; the item "fruit" was supplemented with "other than those in the latex group" and was inserted after the foods in the latex group; the item "vegetables" was supplemented with sweet corn and the explanation that "corn is considered a vegetable when fresh and a cereal when the grains are dried"; the description of the item "legumes" was supplemented with "lentils and soy"; an item "cereals (wheat, rye, barley, oats)" was added to the questionnaire after the item "legumes"; an item "do regional foods (manioc, yams, açaí, etc.) provoke reactions in you?" was inserted into the questionnaire after the item "beef"; (c) in question 7, it was made clear that more than one response could be chosen for the type of reaction after ingesting a food and the term OAS was written out in full as oral allergy syndrome; (d) for question 8, the response item "Don't remember" was added for the time taken for reactions to emerge after ingestion of the food; e) in question 10, the item "where did you receive medical treatment?", the option "INEM" (Portuguese National Medical Emergency Institute) was changed for the equivalents in Brazil: "SAMU or UPA"; and the response options "virtual or on-line consultation (Telemedicine)" and "I don't remember where I was treated" were added; a space was provided after the option "self-medication" for the respondent to state what medications were used; (e) in question 15 the item "Do you have any type of allergic disease?" was changed to "Apart from food reactions, do you have any other type of allergic disease?"; the item "asthma (coughing, pieira,

shortness of breath)" (piera is a term for wheezing in Portuguese from Portugal) was changed to "asthma (coughing, chiado, shortness of breath)" (chiado is the equivalent term in Brazil); the item "rhinitis (sneezing, runny nose, and nasal comichão)" (comichão is a term for itching in Portuguese from Portugal) was changed to "rhinitis (sneezing, runny nose, coceira in the nose, and blocked nose)" (coceira is the equivalent term in Brazil); the item "conjunctivitis (lacrimejo, comichão, and red eyes)" (lacrimejo is a term for tearing in Portuguese from Portugal) was changed to "conjunctivitis (lacrimejamento, coceira, and red eyes) (lacrimejamento is the equivalent term in Brazil); the item "skin allergy (eczema, comichão, scaling, or babas na pele) (babas na pele is a term for a skin rash in Portuguese from Portugal) was changed to "skin allergy (eczema, itching, scaling, urticaria); (f) in question 16, the item "uncles" was changed to "biological uncles" and "cousins" and "children" were added; and (g) question 17 "If possible, would you like to continue the study with a Immunology and Allergy consultation at a reference Hospital?", was removed for ethical reasons.

## Sample size calculation

The parameters adopted were a 95% confidence level, a 2% maximum absolute sampling error, and a 10% maximum prevalence of FA, resulting in a sample size of 865 elderly participants. Considering a 30% non-response rate, it is intended that 1,236 elderly people will be interviewed, distributed proportionally among the 23 participating Brazilian states. In order to determine the distribution of these individuals among the different states, we used the proportional distribution of elderly people in the general Brazilian population, estimated at 20,369,810, according to the most recent demographic census conducted by the Brazilian Institute of Geography and Statistics (IBGE),[11] as shown in Table 1.

The questionnaire will be made available on the Google Forms platform and should be answered by the patient during the medical consultation. The treating physician will read the questions and fill out the questionnaire. Each completed questionnaire will be identified by the participating center's code and the participant's recruitment number.

## Ethical considerations

The study will be submitted to prior evaluation by the ethics and research committee for research

### Questionnaire on Food allergies in elderly Brazilians

Date of administration: _____/_____/_____

1) **Sex**
   - ○ Male
   - ○ Female

2) **Highest educational level achieved by the elderly subject:**
   - ○ No education
   - ○ Incomplete elementary education or equivalent
   - ○ Complete elementary education or equivalent
   - ○ Incomplete secondary education or equivalent
   - ○ Complete secondary education or equivalent
   - ○ Incomplete higher education or equivalent
   - ○ Complete higher education
   - ○ Postgraduate certificate
   - ○ Masters degree
   - ○ Doctorate

3) **Age in years**

   [                    ]          Date of birth: _____/_____/_____

4) **Would you like to answer the questionnaire?**
   - ○ Yes
   - ○ No

5) **Have you ever had an allergic reaction to any type of food?**
   - ○ Yes
   - ○ No

   *If question 5 was answered "No", go directly to questions <u>15 and 16</u> and end the interview.*

6) **Which foods provoke or have provoked reactions? (multiple choice)**
   - ○ Milk and dairy
   - ○ Eggs
   - ○ Fish
   - ○ Seafood other than mollusks (seafood or crustaceans: shrimp, crab, lobster, etc.)
   - ○ Mollusks (mussels, octopus, squid)
   - ○ Peanuts
   - ○ Dry fruit (cashews, Brazil nuts, almonds, pistachio, hazelnuts, walnuts, etc.)
   - ○ Latex group (kiwi, banana, mango, carica papaya, figs, tomatoes)
   - ○ Fruit (other than those in the latex group)
   - ○ Vegetables (sweet corn, potatoes carrots, collard, etc.). NB: corn is considered a vegetable when fresh and a cereal when the grains are dried
   - ○ Legumes (beans, chickpeas, peas, lentils, soy, etc.)
   - ○ Cereals (wheat, rye, barley, oats)
   - ○ Chicken
   - ○ Pork
   - ○ Beef
   - ○ Regional foods (manioc, yams, açaí, etc.)
   - ○ Others
   - ○ Don't remember

   If "Others" was chosen, specify:

   [                                                                    ]

**Figure 1**

Questionnaire on Food allergies in elderly Brazilians

**7) What type of reaction did you have? (describe the symptoms provoked against the foods that caused them. If subject doesn't remember, write "Don't remember")**
NB: more than one symptom can be endorsed per food.
OAS (Oral Allergy Syndrome)

| | Urticaria/ Angioedema | Contact Dermatitis | OAS | Ocular | Nasal |
|---|---|---|---|---|---|
| Milk and dairy | | | | | |
| Eggs | | | | | |
| Fish | | | | | |
| Seafood | | | | | |
| Mollusks | | | | | |
| Peanuts | | | | | |
| Dry fruit | | | | | |
| Latex group | | | | | |
| Fruit (other than those in the latex group) | | | | | |
| Vegetables | | | | | |
| Legumes | | | | | |
| Cereals | | | | | |
| Chicken | | | | | |
| Pork | | | | | |
| Beef | | | | | |
| Regional foods | | | | | |
| Others | | | | | |
| Don't remember/ Don't know | | | | | |

| | Respiratory | Abdominal | Anaphylactic shock | Others |
|---|---|---|---|---|
| Milk and dairy | | | | |
| Eggs | | | | |
| Fish | | | | |
| Seafood | | | | |
| Mollusks | | | | |
| Peanuts | | | | |
| Dry fruit | | | | |
| Latex group | | | | |
| Fruit (other than those in the latex group) | | | | |
| Vegetables | | | | |
| Legumes | | | | |
| Cereals | | | | |
| Chicken | | | | |
| Pork | | | | |
| Beef | | | | |
| Regional foods | | | | |
| Others | | | | |
| Don't remember/ Don't know | | | | |

**Figure 1** *(continuation)*
Questionnaire on Food allergies in elderly Brazilians

8) **How long did it take for reactions to occur after ingestion of the food? (If necessary, specify per food)**
- ◯ Less than 30 min
- ◯ 30 min to less than 2 hours
- ◯ 2 hours to 24 hours
- ◯ More than 24 hours
- ◯ Don't remember

9) **Did you need medical treatment? (If necessary, specify per food)**
- ◯ Yes
- ◯ No

10) **If question 9 was answered "Yes", where were you treated?**
- ◯ Hospital emergency department
- ◯ SAMU / UPA
- ◯ Health center during first 24 hours
- ◯ Family physician after 24 hours
- ◯ Virtual or on-line consultation (telemedicine)
- ◯ Seen by a specialist
- ◯ Self-medication. Specify medications used: _____
- ◯ I don't remember where I was treated

11) **How many similar episodes have you had with the same food? (If necessary, specify per food)**
- ◯ Only 1 episode
- ◯ 2 to 5 episodes
- ◯ More than 5 episodes
- ◯ Don't remember

12) **How long since you last had a reaction? (If necessary, specify per food)**
- ◯ Less than 1 month
- ◯ 1 to 6 months
- ◯ More than 6 months to 1 year
- ◯ 1 year to 5 years
- ◯ More than 5 years
- ◯ Don't remember

13) **Have you ever been diagnosed with food allergy by a physician?**
- ◯ Yes
- ◯ No

14) **Have you ever had a consultation with an allergy specialist?**
- ◯ Yes
- ◯ No

15) **Other than reactions to food, do you have any type of allergic disease? (multiple choice)**
- ◯ Asthma (coughing, wheezing, shortness of breath)
- ◯ Rhinitis (sneezing, runny nose, itching nose, blocked nose)
- ◯ Conjunctivitis (eyes watering, itching, reddened)
- ◯ Allergy cutaneous (eczema, itching, scaling, urticaria)
- ◯ No
- ◯ Others (specify): _____

16) **Does anyone in your family have an allergic disease? (multiple choice)**
- ◯ Mother or father
- ◯ Brother or sister
- ◯ Grandparents
- ◯ Biological uncles
- ◯ Cousins
- ◯ Children
- ◯ No
- ◯ Others (specify): _____

*Thank you very much for answering this questionnaire!*

**Figure 1** *(continuation)*
Questionnaire on Food allergies in elderly Brazilians

**Table 1**

Elderly population in Brazil and numbers of research participants, by the Brazilian states in which the Brazilian Association of Allergy and Immunology is active

| States | Number of elderly people (≥ 60 years) | |
|---|---|---|
| | Brazilian population, N (%) | Sample, n |
| Alagoas | 276,170 (1.36) | 17 |
| Amazonas | 210,173 (1.03) | 13 |
| Bahia | 1,450,009 (7.12) | 88 |
| Ceará | 909,215 (4.46) | 55 |
| Distrito Federal | 198,012 (0.97) | 12 |
| Espírito Santo | 364,861 (1.79) | 22 |
| Goiás | 560,450 (2.75) | 34 |
| Maranhão | 567,657 (2.79) | 34 |
| Mato Grosso | 240,416 (1.18) | 15 |
| Mato Grosso do Sul | 239,594 (1.18) | 15 |
| Minas Gerais | 2,311,084 (11.35) | 140 |
| Pará | 534,461 (2.62) | 32 |
| Paraíba | 451,101 (2.21) | 27 |
| Paraná | 1,172,154 (5.75) | 71 |
| Pernambuco | 936,759 (4.60) | 57 |
| Piauí | 331,772 (1.63) | 20 |
| Rio de Janeiro | 2,079,502 (10.21) | 126 |
| Rio Grande do Norte | 343,443 (1.69) | 21 |
| Rio Grande do Sul | 1,461,480 (7.17) | 89 |
| Santa Catarina | 656,133 (3.22) | 40 |
| São Paulo | 4,771,822 (23.43) | 290 |
| Sergipe | 185,999 (0.91) | 11 |
| Tocantins | 117,543 (0.58) | 7 |
| Total | 20,369,810 (100) | 1,236 |

\* Data from the most recent IBGE Demographic Census.[11]

involving human subjects of the Coordinating Center of the study, located at the Hospital Universitário Antônio Pedro - HUAP/UFF. All patients should sign a free and informed consent form before completing the questionnaire.

In addition to the coordinating center, the option to participate will be opened to other centers, termed coparticipants, which will follow the same procedures for study approval by their own ethics and research committees.

### Statistical analysis

Initially, tables of frequency distributions will be constructed for the sociodemographic characteristics (sex, age, and educational level), presence/absence of self-report FA, foods identified as responsible for allergic reactions, types of reactions, time before appearance of symptoms after ingestion of the food, date of last allergic reaction, frequency of prior episodes of adverse reactions to the food, need for medical attention because of the reaction, and personal and family history of allergic diseases, among others). Additionally, bivariate associations will be evaluated using parametric or nonparametric tests with a 5% significance level.

Taking presence or absence of self-report FA as the point of analysis, a generalized linear model will be constructed to identify factors statistically associated with prevalence of self-report FA in elderly Brazilians, considering a 5% significance level.

### Conclusions

The study objective is to collect and quantify more accurate data on the prevalence of self-reported FA in the elderly, using a validated questionnaire. These data on FA self-reported by the elderly population will also allow comparisons with data available in the world literature, such as prevalence, symptoms, and foods involved, among others.

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