

# Prevalence of Allergies in Brazil and Impact on Skin - Epidemiological Study on a Representative Sample of Brazilian Adults

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## Abstract

The skin is one of the largest targets for allergic and immunologic responses. An online survey was conducted in Brazil on 2,003 adults as a representative sample of the general Brazilian population. 37.3% of Brazilian adults (mean age 38 +/- 13.2 years old) reported having allergies. Reported allergies included respiratory allergies (74.6%), skin allergies (52.7%) and food allergies (46.1%), and 82% reported their allergies had been diagnosed by a doctor. 60% of those who reported allergies also reported experiencing associated skin reactions, they were 1.3 to 4.5 times more likely to report a cutaneous disease and were 3 times to report a sensitive skin compared to those who did not report allergies. In addition, those that reported allergies were also 3 times more likely to report experiencing skin reactions when using skincare products. It is estimated that over 55 million Brazilian adults report having allergies. These results will help raise the awareness among both health care professionals and general population about the burden of allergies and the need to develop solutions to mitigate their impact on health.

**Keywords:** Allergies; Food Allergy; Skin Allergy; Respiratory Allergy; Prevalence; Skin Side Effects

## Introduction

Allergic diseases are much more common in childhood and adolescence and generate high costs for the health system, also interfering with the quality of life of the adult population. This is because despite the constant evolution in the elucidation of the pathophysiology of these allergic diseases and the ever-increasing therapeutic options, the interaction between genetic and environmental factors is increasingly questioned. After the industrial revolution, there was a marked increase in the prevalence of allergic diseases. The hypothesis that environmental factors are determinant

in increasing this incidence suggests a relationship between modified hygienic standards, cumulative exposure to pollution, aggressors, skin barrier alterations, decreased host microbiota diversity, and more recently, increased use of cosmetic products by individuals that historically had not used them, such as male patients.

There are several different types of allergies that are relevant when discussing the epidemiology of allergic diseases. That includes; allergic rhinitis, drug eruptions, food allergies, urticaria, bronchitis, atopic and contact dermatitis, and currently a condition called "sensitive or hyper-reactive skin

syndrome". More recently, several studies have shown the increasing prevalence of these allergic diseases worldwide. In Brazil, the prevalence of physician-diagnosed asthma, rhinitis and atopic dermatitis was predetermined for the first time in 2001. This prevalence was, on average, 12%, 39% and 8%, respectively, according to previous study [1-6]. There are some documented studies on food allergies, however with data still limited to select population groups and therefore representing a slightly incomplete view. In these studies, cutaneous manifestations are among the most cited, the most prevalent being IgE-mediated.

The cutaneous manifestations related to food hypersensitivity may manifest as urticaria, angioedema and eczema. Compared to other countries in Latin America and even the rest of the world, Brazil has high prevalence of allergic diseases, and asthma-related symptoms, with average values of approximately 20% varying from one region to another [5,7]. Perhaps due to global climate change, higher hygiene standards leading to lower microbiota diversity, industrialization of nations with increased pollution and greater indiscriminate use of chemical agents, allergy is becoming more common. Its complexity is no longer limited to specific patient groups, climatic stations, or defined locations. Thus, there is a complex network of triggers of allergic disease crises. Many of these demonstrate the great influence of environmental factors and factors related to the host and way of life. They generate a growing prevalence of a variety of allergic diseases with a chronic course. In this paper, we describe the results of an online survey assessing allergy prevalence in Brazilians, outline the populations who report allergies, and characterize the skin conditions associated with allergy.

## Methods

### Study Population

A polling institute (HC Conseil, Paris, France) conducted an online survey in Brazil between November 2018 and January 2019. A sample of the general population aged over 18 years, considered as adult population, was then recruited. Proportional quota sampling was applied to render the study population representative of the Brazilian general population over 18 years of age following data available and published. These quotas were based on the following aspects: sex, age, socio-professional status and regional distribution. Data were collected via Internet by random selection of 2,003 Brazilian people among the large number of internet users over 18 years of age who agreed to participate. Each participant was contacted by e-mail, and if the contact failed or if the questionnaire was not totally completed, another participant with the same characteristics was randomly selected.

### Survey

This research employed completely anonymized data without involving direct patient contact, so institutional review board approval was not necessary prior to study initiation. Respondents were asked a range of socio-demographic questions including gender, age, occupation/social class, area of residence; tobacco use; phototype; presence of allergies; type of allergies; allergens; medical diagnosis confirmation; therapeutic treatment; symptoms, skin pathologies, skin effects and skin symptoms. Questions regarding the impact of environmental factors like exposure to environmental pollution and sun were also asked. Missing data was not allowed, respondents were thus required to provide an answer to all questions.

### Statistical Analysis

In this descriptive study, subjects reporting allergies were compared to subjects who did not report any allergies. Quantitative variables were expressed as mean and standard deviation. Qualitative variables were expressed as frequencies and percentages. Comparisons between groups were performed using the Student test in the case of quantitative variables; for categorical variables, intergroup comparisons were done with the  $\chi^2$  test. Relative risk (RR) was calculated for probability comparison between the population reporting allergies to the population who did not report allergies. The level of significance was set at 5%. Statistical analyses were performed using R software version 3.6.1.

## Results

### Global Population

Out of the 2,003 respondents (18 to 74 years old, 48.9% males and 51.1% females), 37.3% of subjects (mean age 38+/- 13.2 years old) reported having allergies (of which 41.3% were men and 58.7% were women). 6.1% of the total population lived in rural areas (< 20,000 inhabitants), 18.8% in suburban or medium size cities (between 20,000 and 100,000 inhabitants), 75.1% in large cities (> 100 000 inhabitants), and 15.5% were smokers. The phototype repartition of the total population was 10.9%, 22.4%, 46.7%, 13.6%, 3.2% and 3.2% for respectively phototype I to VI. Reported allergies included respiratory allergies (74.6%), skin allergies (52.7%) and food allergies (46.1%). 82% reported their allergies had been diagnosed by at least one doctor, a dermatologist or a general practitioner most frequently (Table 1). However, many reported not using any treatment (corticosteroids, antihistamine or other) - respectively 43.7%, 47% and 52.5% of those with respiratory, skin and food allergies. 52.8% were able to identify the allergen(s) responsible for their allergies (mainly mites and mold), as well as the main symptoms

associated with their allergies were allergic rhinitis or eczema (Table 2). 60% of those who reported allergies also reported experiencing associated skin reactions. In 67.9% a doctor diagnosed this skin reaction, and 50.8% of those experiencing skin reactions reported resorting to topical and/or oral treatments (Table 3).

| Allergen Reported by participants                           | n   | %      |
|---|-----|--------|
| Participants reporting an allergy                           | 748 | 37,34% |
| Participants able to name the allergy                       | 395 | 52,81% |
| Percentage of participants diagnosed by a doctor            | 614 | 82,09% |
| Health professional who diagnosed the participant's allergy |     |        |
| Dermatologist   | 225 | 36,64% |
| General Practitioner  | 198 | 32,25% |
| Allergy Specialist  | 106 | 17,26% |
| Otolaryngologist  | 33  | 5,37%  |
| Pulmonary Specialist  | 21  | 3,42%  |
| Pediatrician  | 19  | 3,09%  |
| Other specialized physician                                 | 8   | 1,30%  |
| Homeopathic doctor  | 3   | 0,49%  |
| Acupuncturist   | 1   | 0,16%  |

**Table 1:** Doctors who diagnosed allergies.

| Symptoms associated with allergy reported by participants | n   | %      |
|---|-----|--------|
| Allergic Rhinitis (hay fever)                             | 518 | 69,25% |
| Eczema/Atopic Dermatitis                                  | 185 | 24,73% |
| Asthma  | 99  | 13,24% |
| Other   | 85  | 11,36% |
| Edema   | 82  | 10,96% |
| Bronchitis with wheezing                                  | 79  | 10,56% |
| Conjunctivitis  | 77  | 10,29% |
| Allergen Reported by participants                         | n   | %      |
| Dust mites  | 500 | 66,84% |
| Mold  | 458 | 61,23% |
| Pollens   | 272 | 36,36% |
| Dogs, cats, ferrets, other animals                        | 262 | 35,03% |
| Food Allergens  | 208 | 27,81% |
| Cockroaches   | 160 | 21,39% |
| Hymenoptera (bees, wasps, hornets etc.)                   | 112 | 14,97% |
| latex   | 110 | 14,71% |
| Other   | 70  | 9,36%  |

**Table 2:** Symptoms and allergens related by the allergic population.

| Allergen Reported by participants                             | n   | %      |
|---|-----|--------|
| Percentage of participants reporting skin reaction            | 449 | 60,03% |
| Percentage managed by a doctor                                | 305 | 67,93% |
| Health professional who managed the skin reaction?            |     |        |
| Dermatologist   | 174 | 57,05% |
| General Practitioner  | 85  | 27,87% |
| Allergy Specialist  | 31  | 10,16% |
| Participants reporting prescribed treatment for skin reaction |     |        |
| What kind of treatment was prescribed for your skin reaction? |     |        |
| Topical   | 142 | 62,28% |
| oral  | 130 | 57,02% |
| Dermocosmetic   | 45  | 19,74% |

**Table 3:** Skin reactions associated with allergies.

### Allergic Population Versus Non-Allergic Population

The population who reported allergies was slightly younger (mean age 38 +/- 13.2 versus 39.3 +/- 14.2 years old, p=0.02) in comparison to the population who did not report allergies. They included more women (58.7 vs 46.5%) (p<0.0001), were slightly more likely to live in big cities (77 vs 73.9%, p=0.02) and to had a light (I, II, III) phototype (81.7 vs 79%, p=0.157). However, the two populations were similar in their smoking status.

Those who reported allergies were 1.5 to 4.5 times more likely to also report a skin disease (contact eczema (RR=4.17 [2.93 – 5.91], p<0.001), sun allergy (RR=2.59 [2.22 – 3.02], p<0.001), atopic dermatitis (RR=3.09 [2.41 – 3.93], p<0.001), rosacea (RR=2.63 [1.93 – 3.58], p<0.001), psoriasis (RR=2.15 [1.48 – 3.09], p<0.001), or acne (RR=1.28 [1.15 – 1.42], p<0.001)) and were 2 times more likely to report sensitive skin (RR=1.89 [1.70 – 2.10], p<0.001) compared to those who did not report allergies (Figure 1). They were significantly more likely to report sensitive skin (57.7 vs 30.6%), particularly very sensitive skin (20.5 vs 9.2%) (p<0.0001) but also sensitive eyes (64.2 vs 42.9%, p<0.001) and having parents with sensitive skin (42.5 vs 22%, p=0.0001). Interestingly, 38% of those who reported allergies also reported having AD during childhood versus 16.6 % for those who did not report allergies (p<0.001). Those who reported allergies were more likely to experience skin discomfort and reported a higher incidence of severe skin discomfort (Figure 2). They were also more likely to report experiencing skin reactions (pruritus: RR=1.93; burning: RR=2.25 or tickling: RR=1.95 p<0.001) when using skincare products (Figure 3).

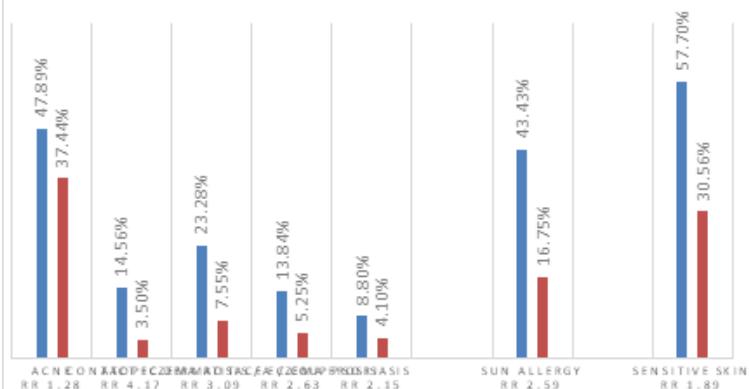


Figure 1: Skin diseases in the two populations.

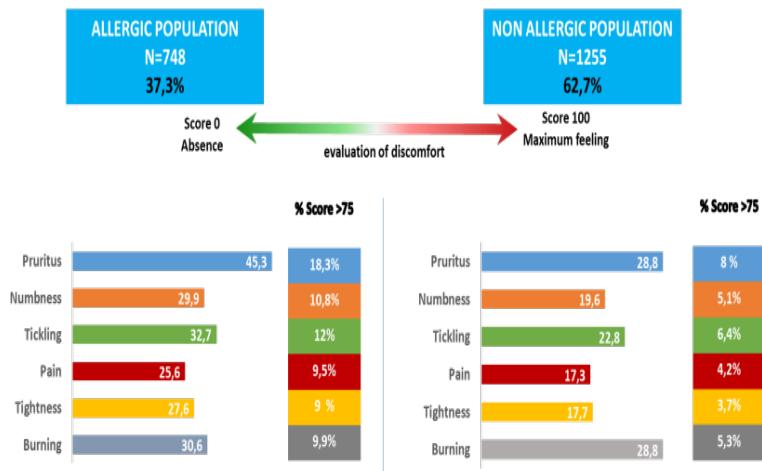
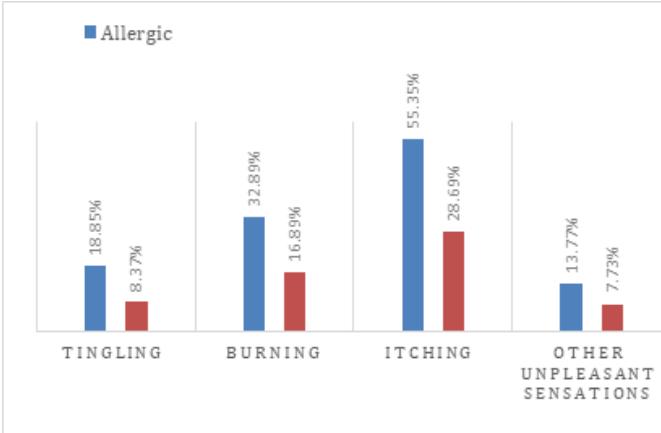


Figure 2: Skin discomforts in the two populations.



**Figure 3:** Skin discomforts associated with skincare products in the two populations.

## Environmental Impact

The population who reported allergies was not significantly

more impacted by air, water, ground, noise, light and radiation pollution (NS) than the population who did not report allergies (Table 4).

| Pollutants | Impacted           |                         |      |         | Worried            |                         |      |
|------------|--------------------|-------------------------|------|---------|--------------------|-------------------------|------|
|            | Allergic           | Non Allergic            | RR   | P-value | Allergic           | Non Allergic            | RR   |
| Air        | Allergic<br>n= 748 | Non Allergic<br>n= 1255 | 1,01 | ns      | Allergic<br>n= 748 | Non Allergic<br>n= 1255 | 1,00 |
|            | 89,97%             | 88,84%                  |      |         | 43,58%             | 43,59%                  |      |
|            |                    |                         |      |         |                    |                         |      |
| Water      | 41,31%             | 34,10%                  | 1,21 | <0.05   | 7,09%              | 7,17%                   | 0,99 |
| Soil       | 30,08%             | 25,10%                  | 1,20 | <0.05   | 3,07%              | 2,71%                   | 1,13 |
| Noise      | 65,24%             | 58,41%                  | 1,12 | <0.05   | 28,07%             | 27,81%                  | 1,01 |
| Light      | 49,47%             | 38,49%                  | 1,29 | <0.05   | 11,76%             | 8,84%                   | 1,33 |
| Radiation  | 26,87%             | 20,80%                  | 1,29 | <0.05   | 5,08%              | 5,18%                   | 0,98 |

**Table 4:** Impact of the pollution in the two populations.

They more frequently claimed that pollution affected their way of life (87.3 vs 76.6%, p<0.0001) and had a health and well-being impact (95.5 vs 87.6%, p<0.0000). They also more commonly noted an impact of pollution on their skin (60.6 vs 45.6%, p<0.0001, quite to very important for 76.5 vs 56.1%, p<0.0001). However, they use similarly dermocosmetic products to protect their skin against pollution (20 vs 14.3%). In the population who reported allergies, significantly more had moderate and intense daylight solar exposure than the population who did not report allergies (74.8 vs 68.3%, p<0.0001). Nevertheless, 12.7% reported not using any photoprotection similar to 12.9% in the population who did not report allergies (NS). They were more likely to apply sunscreen when working outdoors (38.4 vs 29.4NS) or during intense sun exposure (65 vs 67.8%, NS) but not during outdoor leisure activity (32.5 vs 31.4%, NS).

## Discussion

In this survey of a representative sample of the general Brazilian adult population, 37.3% of survey respondents reported having allergies. Self-report may be one limitation of this study, even if 82% of the respondents who reported allergies said that a doctor had officially diagnosed these allergies. Non-immunologically based adverse responses to a food, for example, may easily be misconstrued to be an allergic reaction and self-reported as such. Another limitation of this study is that only adults 18 years and older were sampled when allergy rates are increasing most rapidly among children. There are many theories attempting to explain the ongoing escalation in allergy prevalence. One of them is the role of the skin barrier in allergic sensitization. Specifically, dysfunction of the skin barrier can increase the likelihood of allergens coming into contact with the immune system, which can trigger sensitization. However,

the impact of allergies on other skin conditions has been less thoroughly characterized. Nonetheless, our survey results show a clear association between reporting any type of allergy and reporting skin disease or skin sensitivity. While some of these links are relatively well-established, such as that between food allergy and atopic dermatitis, others are less clear [8-11].

## Conclusion

Understanding allergy is critical to providing care to the vast proportion of Brazilian who suffer from its symptoms. For the millions of people coping with allergies, they can create significant lifestyle burden. Anxiety, impact on relationships, embarrassment, and frequent interruptions to normal tasks brought on by respiratory, food, and skin allergy symptoms all contributing to poorer quality of life in those people. Much work still needs to be done in developing ways to manage allergies. Strategies such as avoidance can be an option as 52.8% of survey respondents were able to identify the causative allergens. However, without well-developed therapeutic solutions for those with existing allergies, the prevalence of allergies is bound to continue to rise, even as incidence stabilizes [12-15].

## Conflicts of Interest

Seite S is employee of La Roche-Posay, France. Lio P has served as a consultant and speaker for L'Oreal/La Roche-Posay. He has also been a consultant/advisor for Mircros, Pierre-Fabre, Johnson & Johnson, Syncere Skin Systems, Altus Labs, AOBiome, Galderma, IntraDerm, Theraplex, Unilever, and is a board member of the National Eczema Association. Taieb C, Strugar T L, and Curi T have served as a consultant for L'Oreal/La Roche-Posay.

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## Author Contributions

SS and CT have participated in the conception and design of the studies and acquisition and analysis of data. All authors have participated in the preparation and critical review of the manuscript and read and approved the final submitted version.

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