

# Prevalence of Allergies and Food Intolerance: A Comparison between the Canadians of Persian Descent and Canadians of European Descent

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## Abstract

**Background:** The prevalence of reported allergic diseases is higher in North-America than in other countries around the world. Further, certain types of allergies are more common in some geographic regions or amongst different ethnic populations. This phenomenon has not been well studied amongst the Persian population in the Canadian context; therefore, the current study aimed to compare the prevalence of perceived and diagnosed non-food and food allergies, and food intolerance between Canadians of Persian descent (CPD) and Canadians of European descent (CED), within a sample population of British Columbia residents, their family members and close friends.

**Methods:** Participants were recruited via convenience and snowball sampling, and information about allergy history was collected through in-person and telephone interviews. The prevalence of perceived and diagnosed allergies and food intolerances were compared between CPD and CED. In total, data was reported about 4,404 individuals.

**Results:** The prevalence of all perceived allergies was significantly higher amongst CED compared to CPD [RR (95% CI) = 2.33 (1.6, 3.3)]. A similar pattern was observed for diagnosed food and nut allergy. As well, no cases of perceived or diagnosed food intolerance were reported amongst Persians in the study population.

**Conclusion:** In conclusion, these findings have clinical implications for the treatment and prevention of allergies and food intolerance in BC and Canada. The disproportionate effect of allergies and food intolerance on Canadians of European descent warrants the implementation of targeted public health prevention measures. The genitival and environmental reasons for lack of food intolerance in Canadians of Persian descent should also be investigated.

**Keywords:** Allergy; Food; Intolerance; Non-Food; Nut

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## INTRODUCTION

An allergic reaction is defined as an Immunoglobulin E mediated immune response to a non-harmful foreign substance (1). Previous research has shown that many allergies and allergic disorders are more common within developed countries and populations of individuals born in developed countries. In a cross-sectional survey of children in the United States (US), Silverberg et al. reported a lower prevalence of allergies in foreign-born children compared to those born in the US (2). As well, the prevalence of allergic disorders amongst foreign-born children in the study increased after ten years in the country (2).

In addition, the order frequency of specific allergens is reported to be higher in some countries compared to others (3). Peanuts are one of the most common food allergens in North America – in 2006 the World Health Organization

(WHO) estimated the prevalence peanut allergy in the US to be between 0.6% and 1.0% (4). However, peanut allergy is believed to be uncommon in many other regions of the world, such as Asia – reported in Singapore to be only 0.3% (5) and 0.43% in the Philippines (6). Similarly, in a cross-sectional study of Iranian children in Tehran, peanut was reported as one of the least common food allergens, while tomato was one of the top food allergens (3). The differences in reported peanut allergy prevalence been ascribed to several different causal mechanisms, including maternal exposure, and early oral and environmental transcutaneous exposure (7). For instance, in the Iranian culture, tomatoes are a staple in a child's diet, while peanuts are rarely consumed (7).

The main purpose of this study was to compare the prevalence of perceived and diagnosed non-food allergies, food allergies and food intolerance between CPD and CED, within a sample population of British Columbia (BC) residents,

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their family members and close friends. To the authors' knowledge, this is the first study to examine this phenomenon within the Persian population in the Canadian context.

## METHODS

### Ethics

The study was approved by the University of British Columbia's Behavioural Research Ethics Board (ref. no. H16-00826). Informed consent was obtained from all participants.

### Study population and recruitment

The participants in this study were part of a larger allergy study population of individuals living in BC aged between 19 and 65 years. Recruitment of participants occurred via convenience and snowball sampling – individuals from the University of British Columbia and the BC Centre for Disease Control were invited via email and/or in-person invitations, and asked to refer friends (non-relatives).

### Data collection

Data was collected using a pre-designed paper questionnaire administered by the first author (AR) and a research student through in-person and telephone interviews. The questionnaire was pilot tested and validated, and to account for inter-observer reliability, the two interviewers conducted ten interviews together (results are not reported).

Interviewees were asked whether they or their current living family members, close friends and acquaintances possess allergies. Information about acquaintances was excluded from the final analysis, as the denominator was not precise. Perceived allergies were categorized as food (nuts, fruits/vegetables, shellfish/seafood, milk/dairy, wheat/gluten, eggs and other foods), nuts (peanuts and tree-nuts), non-food (seasonal/hay fever/dust, animal and medications), and food intolerance (lactose and gluten). Other/unknown allergies and celiac disease were also recorded (data not shown). Nut allergy was analyzed separately from other food allergies, as it is one of the most common allergies in North-America.

Demographic information (age, sex, country of origin, immigrant status and immigrant generation) was also collected. Immigrant status and generation were evaluated based on Statistics Canada definitions (8, 9). Country of origin and immigration status of family members and close friends were suspected to be the same as the interviewee they were associated with, unless otherwise indicated.

Further information about age of onset, physician diagnosis, anaphylaxis, treatment (epi pen, antihistamines, immunotherapy and other), and hospitalization, was collected for all perceived allergies. However, for the purposes of this analysis, only diagnosis was considered.

### Statistical analysis

The data was described and appropriate parametric and non-parametric statistical tests were conducted using Microsoft Excel and IBM SPSS (Version 23).

## RESULTS

### Study sample characteristics

The final analytic sample for this study consisted of 4,404 individuals: interviewees (n=87), immediate family members (n=382), other relatives (n=2,035), and close friends

(n=1,900) (Table 1). Approximately 85% of both interviewees and individuals in the total analytic sample were categorized as being of CED. As well, 67% of all interviewees self-identified as immigrants (48% first generation, 26% second generation, and 26% third generation). The prevalence (95% CI) of perceived allergies and food intolerance in the total analytic sample was 11.1(10.17-12.03) %. Of these perceived allergies and food intolerances, 60% were diagnosed by a physician.

**Table 1.** Demographic characteristics of study interviewees (British Columbia residents between 19-65 years of age who were recruited via convenience and snowball sampling (n=87).

	All Interviewees n (%)
Female	64 (74)
Country of Origin	
European decent	75 (86)
Persian decent	12 (14)
Immigrant	58 (67)
Immigrant Generation	
1	28 (32)
2	15 (17)
3	15 (17)

### Perceived and diagnosed allergies – Comparison between CPD and of CED

The overall prevalence (95%) of perceived allergy was significantly higher amongst CED 10.5 (9.51-11.49) % compared to CPD (4.5 (2.97-6.03) %, [RR (95%CI) = 2.33 (1.64, 3.31)]. Additionally, the prevalence of perceived food [RR (95%CI) = 2.26 (1.37, 3.75)], nut [RR (95%) = 14.34 (2.00, 102.99)], and non-food allergy [RR (95%CI) = 2.40 (1.45, 3.97)] were also significantly higher amongst CED, compared to CPD (Figure 1).

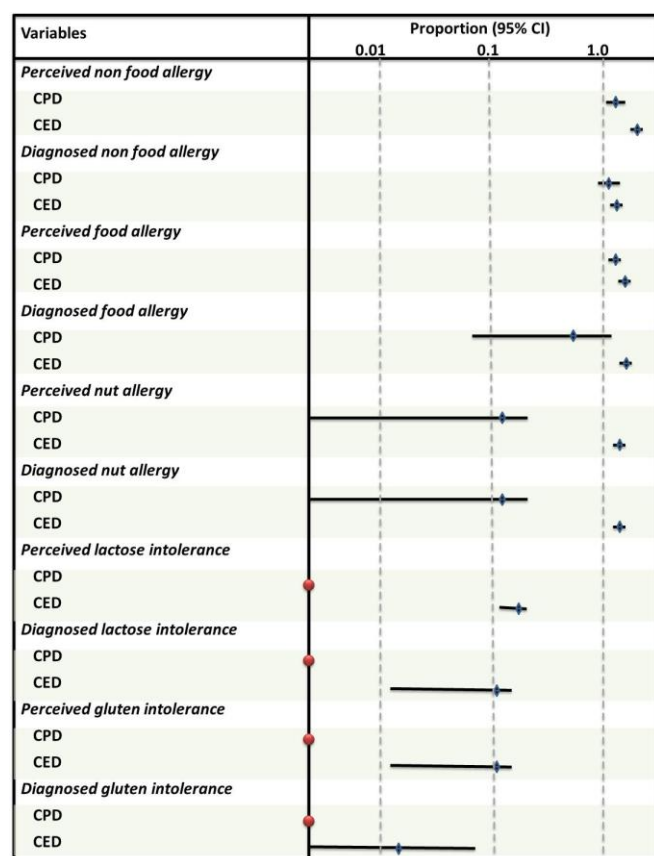
When diagnosis of these perceived allergies was considered, only the prevalence of diagnosed food [RR (95% CI) = 4.97 (2.04, 12.10)] and nut allergy [RR (95% CI) = 13.00 (1.81, 93.50)] were significantly higher amongst CED, compared to CPD. There was no significant difference in the prevalence of diagnosed non-food allergy between the two populations (Figure 1).

### Perceived and diagnosed food intolerances - Comparison between CPD and CED

Amongst CED, the prevalence (95% CI) of lactose intolerance was 0.14 (0.02-0.25) %, and the prevalence (95% CI) of gluten intolerance was 0.03 (-0.03-0.08) % (Figure 1). Comparably, there were no cases of food intolerance reported amongst Persians in the study (Figure 1).

## DISCUSSION

The current study compared the prevalence of perceived and diagnosed allergies and food intolerance between CPD and CED, in a sample population of BC residents, their family members and close friends. It was found that compared to CPD, CED were more likely to report cases of perceived non-food, food and nut allergies. When diagnosis was taken into account, CED were more likely to report cases of diagnosed



**Figure 1.** The prevalence (95% CI) of perceived and diagnosed food allergies, nut allergies, non-food allergies and food intolerance amongst the study population of British Columbia residents, their family members and friends (n=4,404). The prevalence of each allergy category is compared between CPD (Canadians of Persian descent) and CED (Canadians of European descent). The red stars indicate that because there were no cases of food intolerance reported amongst Persians, a prevalence rate could not be calculated for lactose and gluten intolerance.

food and nut allergies, compared to CPD. As well, there were no cases of lactose intolerance or gluten intolerance reported amongst CPD in the study population.

In concordance with these findings, previous studies have shown that allergies are more common amongst individuals of North-American or European descent, compared to other ethnic populations (2). This has can possibly be attributed to increased awareness of allergies and food intolerance amongst individuals of North-American or European descent, cultural factors (such as exposure to certain food allergens), environmental factors, and genetic determinants (3, 7). The difference in the prevalence of perceived and diagnosed food allergy and food intolerance between CPD and CED could be due to the fact that the diet is contain different frequencies of many allergens such as gluten, dairy and certain nuts. As well, previous research has shown that Canadian immigrants are less likely to report non-food allergies (10).

As expected, some of the perceived allergies reported in this study were not diagnosed by a physician. Previous studies have shown that many food allergies have been

shown to be over-perceived amongst Canadians (11). In the current study, more cases of food and nut allergies may have diagnosed than cases of non-food allergy, because food and nut allergies tend to manifest in more severe symptoms. For instance, nut allergies can cause fatal or near fatal anaphylactic reactions (12), possibly explaining why the majority of perceived nut allergy cases were diagnosed. These findings emphasize the importance of distinguishing between perceived and diagnosed allergies (13).

Further, future studies should compare the prevalence of allergies and food intolerance between first generation Persian immigrants with varying times since arrival to Canada. Although immigrants are often healthy upon arrival to North-America, they adopt the health status of their new country over time and generations — the likelihood of an immigrant reporting an allergy has been reported to increase by 2% with each additional year in Canada (14).

There are limitations to the current study. First, convenience and snowball sampling are subject to bias, potentially rendering the results less generalizable. However, it is not suspected that the sampling methods influenced the direction of the observed effects. Second, self-report of food allergies can result in misclassification of allergies and/or over-estimation of prevalence (15). To account for this, information about physician diagnosis was collected and analyzed separately from perceived allergy cases. Finally, the information provided about family members and close friends may not be accurate, resulting in missing data. Although this could have contributed to either an over-estimation or under-estimation of prevalence, it is unlikely that this would have attenuated the overall effect.

## CONCLUSION

In conclusion, the current study illustrated that (1) all perceived allergies, and diagnosed food and nut allergies were more prevalent amongst CED compared to CPD; (2) food intolerance was absent in the Persian sub-population of the study. These findings can inform future research and have clinical implications for the treatment and prevention of allergies and food intolerance. Most recently, an addendum was made to the guidelines for preventing peanut allergies based on risk following the Learning Early About Peanut Allergy (LEAP) Study (16). It is now recommended for low-risk infants (with no other food allergies/eczema) that peanut-containing foods be introduced around six months of age, and between four to six months of age after allergy testing for infants at higher risk (with severe eczema/egg allergy/both) (16). The severity of nut allergy in particular, and its disproportionate effect on individuals of European descent in BC, warrant the implementation of targeted public health prevention measures, such as increased allergy testing amongst this population.

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