Ann Allergy Asthma Immunol xxx (2016) 1–5

Contents lists available at ScienceDirect

Review

Prevalence of food allergies in South Asia

Schweta R. Arakali, MD [*]; Todd D. Green, MD [*]; Chitra Dinakar, MD [†]

[*] Children's Hospital of Pittsburgh of UPMC, Pittsburgh, Pennsylvania
[†] Children's Mercy Hospital and University of Missouri–Kansas City, Kansas City, Missouri

ARTICLE INFO

Article history:
Received for publication August 9, 2016.
Received in revised form September 14, 2016.
Accepted for publication September 26, 2016.

ABSTRACT

Objective: To evaluate the published medical literature on the prevalence and types of food allergies in South Asia.

Data Sources: A PubMed search was performed using the keywords *India* and *food allergy*, *Asia* and *food allergy*, and *South Asia* and *food allergy* for any period. Articles cited in selected studies were reviewed for their appropriateness of inclusion into this review.

Study Selection: Publications were included that were original research and fit the topic of food allergy and South Asia. South Asia is defined as region inclusive of India, Pakistan, Bangladesh, and Sri Lanka.

Results: A total of 169 articles were initially identified, and 47 were reviewed in detail for inclusion in this review. The primary focus was placed on 10 studies that consisted of case reports of newly reported or documented food allergy, survey studies that investigated food allergy prevalence in specific demographics, and prospective and cross-sectional studies with case controls, all of which investigated food allergy prevalence by allergy testing in a selected population.

Conclusion: The medical literature on the prevalence and types of food allergy in South Asia indicates that there is a variety of unusual and unique allergens and an overall low incidence of food allergy. There is also an association of increased food allergy prevalence in individuals who live in metropolitan regions or who migrate to communities that have adopted westernization.

Introduction

The prevalence of childhood food allergy, sometimes referred to as the food allergy epidemic, is increasing worldwide and has been documented not only in the United States and Western Europe but also in Asia, including the Indian subcontinent.[1,2] Data suggest that there is a concomitant increase in Asians, particularly among those in the higher socioeconomic strata who have embraced a westernized lifestyle. This increase can be analyzed from 2 perspectives: the increase in indigenous populations that reside in nonwesternized countries and the increase in immigrant populations to westernized nations or in populations that have adopted westernized cooking and consumption practices. Up to 8% of US children have food allergies, and the US Asian population may represent up to 0.5% of food allergic children.[3] In addition, data suggest that immigrant populations tend to develop the diseases of the society to where they migrate.[4] Foreign-born children have a lower prevalence of atopic disease than US-born children, but an increasing prevalence has been seen in individuals who have resided in the United States for at least 10 years.

Similar trends in Asian immigrants have been seen, especially in affluent communities that have adopted a westernized lifestyle.[2,5] In an early Australian study, Australian-born Asians had higher odds of atopic disease compared with those seen in Asian immigrants.[5] Large population-based epidemiologic surveys are relatively few in Asia, specifically in the Indian subcontinent. More rigorously conducted studies evaluating food allergy prevalence that are confirmed with oral food challenges are even scarcer in the Asian medical literature.

Asia is a vast continent with numerous ethnic populations, cultural practices, and cuisines. India, Pakistan, Bangladesh, Nepal, and Sri Lanka comprise the region of South Asia. These countries differ from the rest of Asia in not only the ethnicity of its people but also the foods commonly consumed. Food allergy trends may be different among different ethnic groups, and Asian Indians have a unique diet and may have unusual or different food allergies. In India, most of the population consumes a largely but not solely vegetarian diet, which consists mainly of rice, legumes, grains, and vegetables.[2] In addition, there are a variety of spices that are staple to the South Asian diet, including red chili, coriander, cumin, mustard seed, fenugreek, ginger, turmeric, and curry leaves, of which there has been some recognition of spice allergy in the

Reprints: Schweta R. Arakali, MD, 4401 Penn Ave, AOB-3300, Pittsburgh, PA 15224; E-mail: schweta.arakali@chp.edu.

Disclosures: Drs Green and Dinakar reported having a financial interest in Food Allergy Research and Education and serving on the Food Allergy Research and Education Clinical Advisory Board. Dr Green also reported serving on the Asthma and Allergy Foundation Medical Scientific Council.

http://dx.doi.org/10.1016/j.anai.2016.09.441
1081-1206/

Table 1
Primary Articles Discussed in the Review

Article	Food allergens discussed	Type of study	Year
Mahesh et al[7]	Apple, fish, banana, cow's milk, melon, sesame, shrimp	Cross-sectional, questionnaire	2016
Joplin et al[24]	Peanut	Prospective, population-based cohort study	2014
Panjar et al[25]	Peanut and tree nuts	Cross-sectional, questionnaire	2016
Kamdar et al[26]	Tree nuts, chickpea, capsicum, Indian lentils, avocado, banana, beef, bulgur wheat, coconut, corn, eggplant, garlic, ginger, green peas, jalapeño peppers, kiwi, melon, rice, tomato	Cross-sectional, questionnaire	2015
Patil et al[27]	Fenugreek seed	Case report	1997
Patil et al[29]	Chickpea	Double-blind, double-placebo controlled prospective study	2001
Hedge et al[30]	Mango	Case report	2007
Hedge et al[31]	Mushroom	Case report	2009
Harish Babu et al[32]	Eggplant	Cross-sectional	2008
Caselato-Sousa et al[34]	Amaranth grain	Case report	2012

literature.[6] There is a knowledge gap regarding food allergy trends in the Asian Indian native population, and large population-based epidemiologic surveys are few in the Indian subcontinent. To the best of our knowledge, no review articles have summarized the types of food allergy seen in these countries. The objective of this review article is to evaluate the published medical literature on the prevalence and types of food allergens in the Asian population, with a focus on the South Asian population.

Methods

A PubMed search was primarily used to investigate study articles for this review, using the keywords *India* and *food allergy*, *Asia* and *food allergy*, and *South Asian* and *food allergy* from any period. Publications were included if they were original research and fit the topic of food allergy and South Asia. A total of 169 articles were initially reviewed. Of those, food allergy was the primary focus in 47 studies. Ten studies primarily focused on food allergies in South Asia (Table 1) and consisted of either case reports to newly reported or documented food allergies, survey studies that investigated food allergy prevalence in specific demographics, or prospective and cross-sectional studies with case controls that investigated food allergy by allergy testing. These 10 articles were thoroughly evaluated and are the focus of this review.

Prevalence and Types of Food Allergies in South Asia

The first major study evaluating the prevalence of food allergy on a global perspective is the EuroPrevall-INCO study, published in 2016.[7] This multicenter study evaluated the prevalence of food allergy in randomly selected populations in 8 European countries, India, Hong Kong, and Russia. In the southern part of India, a screening survey that consisted of participant demographic information and adverse reactions to foods was given to more than 11,000 randomly selected adults between the ages of 20 and 54 years. A more detailed questionnaire was given to a subcohort of 588 individuals, including 236 cases and 352 controls. Serum samples were collected from the participants of this cohort for estimation of total and specific IgE levels to 24 foods that were considered to be common food allergies via the ImmunoCAP 250 system (Phadia, Uppsala, Sweden). Participants from India had the highest rates of sensitization to most tested foods compared with those from centers at 6 other European countries (Switzerland, Spain, Netherlands, Poland, Bulgaria, and Iceland). Probable food allergy was defined in this cohort as self-reports of adverse symptoms after consumption of food and specific IgE level to that food of 0.35 kU/L or higher.

Participants in Bangalore, India, had higher rates of sensitization than those in Mysore, with a prevalence of sensitization of 26.5%. This discrepancy was thought to be reflective of the westernization of Bangalore in recent years, a metropolitan commonly referred to as the Silicon Valley of India. Shrimp and sesame seed were the most common sensitizers at 13% each, whereas foods most commonly associated with clinical symptoms were apple, fish, banana, cow's milk, and melon. In contrast to the high rates of sensitization, the prevalence of food allergy was very low at 1.2%, with cow's milk and apple being the most common allergens. The mean total IgE level from participants in India was higher than those observed in Europe. This finding was speculated to reflect the effect of significant exposure to air pollution, insect bites, and parasitic infections on IgE production. Although this study did not use the gold standard for diagnosing food allergy (ie, oral food challenge), it revealed interesting patterns of food sensitization in South India.

Prevalence and Types of Food Allergies in Central and East Asia

A review of the available literature suggests that in Central and East Asian countries, the prevalence of pediatric food allergy is highly variable. A study conducted in northern Thailand on 452 children between the ages of 4 and 7 years revealed a food allergy prevalence of 1.1% when food challenges were used as part of the diagnostic workup.[8] Another food challenge–proven study (published in Mandarin) from 3 cities in China find a higher challenge-proven rate of 6.2% in a population of 1,604 children between the ages of 0 and 2 years.[9,10] In South Korea, a questionnaire-based study revealed a food allergy prevalence as high as 12.6% in children between the ages of 12 and 15 years and 11.3% in children between the age of 6 and 12 years.[11]

In East and Central Asian countries, the more commonly reported food triggers for severe allergic reactions include the major components of the Asian diet: fish, shellfish, bird's nest, buckwheat, and royal jelly. In Singapore,[12] Thailand,[13] and Hong Kong,[14] hospital-based studies on anaphylaxis reveal that crustacean shellfish is one of the most important food triggers in adults and children. Allergy to edible bird's nest from swiftlets has also been described in several Asian populations, including those in Singapore[15] and Malaysia.[16] Royal jelly has been reported to trigger anaphylaxis in individuals living in Hong Kong[17] and in ethnic Chinese living in Australia.[18] Buckwheat triggering anaphylaxis has also been observed in Japan, South Korea, and China.[19–21] Interestingly, few studies have found peanut allergy to be a trigger for anaphylaxis in Asian populations.[22,23] What remain largely unknown are the prevalence and types of food allergens seen in South Asia.

Prevalence of Food Allergy in Immigrants of Asian Origin

In 2014, Joplin et al[24] conducted a prospective cohort study of 5,120 Australian children between the ages of 11 and 15 months to evaluate whether there were differential effects of risk factors for