

Food Induced Anaphylaxis: Causes, Risk Factors and Clinical Management

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Abstract

Abstract Globally, food consumption patterns are becoming more sophisticated and diversified for meeting abrupt increase in projections of food demands. The stance of availability of allergens hazard free food is a rather hectic task to implement and consumers most probably become prone to them. There is no phenomenon for investigating or identifying presence of allergens in food sample by visual inspection. So, majority of individuals possessing food intolerance have confronted with anaphylactic symptoms. Anaphylaxis is an attention attenuating concern because of its increasing invasion in different residential zones of the world. The degree of morbidity and mortality of food allergy were underestimated since a long period of times by its victims and consultant medical staff. With the passage of time the sustainability and resistance of immune regulatory responses of human being become infirm. Hence, as a result of that immune regulatory impairments human susceptible start being prone to severe anaphylactic symptoms such as shortness of breath, swelling of throat and tongue, low blood pressure, vomiting, itchy rash and tingling of nose. The causal agents for provoking anaphylaxis are mast cells and basophils. There are more or less ten prominent foods which trigger anaphylaxis after their ingestion. Hence, avoidance from being in confront with allergen food can limit proliferation of anaphylaxis.

Introduction

Food allergy is a major concern for millions of worldwide communities due to its severe health related consequences. Ingestion of allergens containing foods interact with human immune system; as a result immune system shows adverse response and this response is generally recognized as allergic reactions. The allergic reactions which are occurring in body are of two type; IgE mediated and non IgE-mediated allergic reactions. Onset of these allergic reactions among children is approximately 5% in children and 3 to 4% in adults . These foods based induced allergic reactions results in a variety of disorders and symptoms in human beings. The diagnosis of allergic disorders requires careful medication and laboratory studies for proper inferences and prescription. Moreover, proper screening tests are required for producing tangible evidences regarding food borne allergens. Hence, biochemical properties of food allergens depend upon digestion process. Degradation, cross-reactivity and stability of food allergens are highly influenced by biochemical properties. Biological activities of food allergens are determined by applying in vivo and in vitro research methodologies. Awareness seminars and trainings are needed to educate consumers which are susceptible to food allergy (Branum & Lukacs, 2008).

Worldwide Occurrence of Food Allergy

Immunological hypersensitivity is not an uncommon disorder in existing nations due to its day by day increasing prevalence on worldwide basis. Anaphylaxis and food allergy are growing challenges on worldwide level either they are invading in developed or underdeveloped countries. The statistical figures explicit

that count of allergic reactions among human beings is increasing day by day in children and adults . The biochemical properties of food allergen are key factor in determining nature and intensity of allergic reactions. The biochemical characteristics provide information about mode of action and digestion behavior of consumed foods. Moreover, biochemical characteristic of food allergens give indication of relationship between biological activity and intensity of reactivity of allergens (Prescott, Pawankar, Allen, & Campbell, 2013). There are eight foods; fish, jelly fish, peanuts, egg, milk, wheat, soy and tree nuts which can constitute approximately 90% of allergic reactions. Fish, jelly fish, peanuts, egg, milk, wheat, soy and tree nuts . However, food allergy has become a major concern all over the world because of its severe symptoms and prevalence. According to world health organization about 20% of world population is affected by food allergy. According to rough estimate 1-10% of children and adults are susceptible to food allergy. Invasion of food allergy in toddler infants is 5-8%. Food allergy has now emerged as lifelong concern; whenever individuals become susceptible to food allergy then there are almost negligible chances to get rid of it .

Reaction Mechanism for Food Allergy

Food allergy or anaphylaxis is triggered when IgE oriented antibodies bind to receptors cells having high affinity for mast cells of blood. Once that IgE-mediated reaction proceeds inflammation is seen in progress among tissues and synthesis or activation of cytokines and leukotrienes starts. The degree of IgE oriented mast cells activation depends directly on the dosage of antigen and route of administration of allergen; whereas symptoms of that one includes hay fever, sniffing and life threatening collapses leading to anaphylaxis. Hence, due to occurrence of antibodies in body fluids a phenomenon is triggered which make able antibodies to engage effector cells for inducing adverse reactions . So, the food oriented agents provoking IgE-mediated and non-mediated reactions are listed in **table 1**.

Table 1: Food oriented agents aggravating IgE or Non IgE-mediated anaphylaxis

Anaphylaxis IgE-mediated	Anaphylaxis Non IgE-mediated
Venoms	Intravenous immunoglobulin
Latex	Cytotoxic
Medications	Opioids
Animal Hormones	Psychogenic
Animal or plant oriented proteins	Multimediator
Coloring & Flavoring Compounds	Ethylene Oxide
Intense Exercise	Protamine
Polysaccharides	Angiotensin Enzyme
Vaccination	Idiopathic
Aspirin	Muscle relaxant's
Enzymes & Anti-inflammatory Drugs	Dextran

Allergens Sex Disparity

Sex disparity is important factor to discuss occurrence of allergies. The role of sex disparity is a rather difficult task to understand and explain; except in asthma. Asthma is more prevalent in males than females. Hypersensitivity reactions have increases to a tremendous level on global basis. Almost, 6% children and 3-4% adults are susceptible to fatal allergic mediated responses. Certain types of food allergies emerge in childhood; and some other kind of food allergies particularly nut allergies invade in adults. Some foods particularly tree nuts, celery, sesame, milk, egg, wheat, mustard seed, soy and fish are currently being denoted as red-flag foods in European Union, Canada and USA. Food allergies are complicated genetic disorders which are highly influenced by environmental conditions. Among children prevalence of food allergy is more in male infants than female. Whereas, in adults occurrence of food allergic reactions is more in females than the males .

Food Allergy Management

Food allergy is a key factor in contributing morbidity in human beings because of its life threatening trends and expensive medical care. It is cost consumptive in terms of alleviation treatments and affect adversely living standards negatively in its susceptible. Keeping in view this behavior and nature of anaphylaxis reactions; remedial recommendations and diagnosis management are strongly advocated to address food allergic reactions . In food allergy management role of diagnosis test is most common and acute management can address non-life threatening reactions with minimum remedial side effects. Food allergy management utilizes short time approaches to reduce acute allergic reactions and long term measures to reduce frequency of reoccurrence of allergic reactions. Pharmacological and non-pharmacological approaches are implemented to avoid severe response of allergens. In non-pharmacological approaches dietary modifications are practiced to prevent entry of allergy causing constituents in body or ultimately in blood. In pharmacological remedies usage of anti-allergic medicine is brought into introduction for achieving remedial response. Most of the allergy inducing foods contains proteins which are contributing factor in aggravating anaphylaxis. So, restrictions in intake of culprit proteins are a sole remedy to treat protein based allergic reactions (MD J. W., 2017). However, sometimes in adults and children, particularly in infants that dietary prohibition approach results in protein malnutrition and other nutritional deficiencies. Long term prohibition of dietary plans may results in intense kind health risk. Therefore, long term dietary restrictions should be monitored properly in order to avoid impairment of standard of quality life .

Diagnostic Approaches towards Food Allergy

In vivo methodology is used to identify intrusion of allergy and it involves IgE and skin prick test diagnostic tests and these are front-line tests in order to confirm occurrence of food allergy. The recommended food allergy tests are clinical history of patient, sensitization assessment and restriction of diets for diagnostic purpose. Clinical history of patient is needed badly to evaluate stage and severity of disease. While working with patient history different parameters especially timing and chronicity, reproducibility, family history, eliciting allergens, symptoms and severity are assessed (Muraro, Werfel, Hoffmann-Sommergruber, Roberts, & Beyer, 2014). Sensitization assessment of Food Allergens or standardization procedures is employed to assess IgE sensitization of patients to exposure of food allergens. Skin Prick Test (SPT) can be opted for sensitization assessment. Restriction of diets for diagnostic purpose is result oriented methodology usually employed to diagnose either that food is contributing in inducing allergic reactions or not. These restricted foods are monitored carefully for 2-4 weeks. Mostly considerable relief in symptoms is attainable without dosage of anti-allergic medication. Moreover, in some cases no relief in intensity of symptoms is seen and from this evidence it can easily be inferred that allergic reaction is due to non-food mediated response . The diagnostic based signs and symptoms of allergic reactions are demonstrated in **table 2**.

Table 2: Organ oriented signs and symptoms of allergic reactions

Sign and Symptoms of Allergic Reactions
Cardiovascular Disorders
Shocks, Dizziness, Hypotension
Respiratory Impairments
Rhinorrhea, Pruritus, Nasal Congestion, Cough, Wheezing, Dysphonia
Gastrointestinal Insufficiencies
Lips or tongue swelling, Nausea, Belly Cramp, Vomiting, Diarrhea,
Skin
Angioedema, Atopic Dermatitis, Flushing, Pruritic Rashes

Epidemiology of Food Allergy

Basically, food allergy is genome base disorder in genomics of susceptible individual. Comprehensive studies on food allergies have reflect that impairment in genetic makeup is a sole cause of allergic reactance. The environmental factors can intensify the severity of allergic reaction but are unable to initiate. Therefore,

exact diagnosis of food allergy is a rather difficult task because of different parameters including dietary exposures, geographical variations and estimation of influence of ages. Extensive research and surveys based data is supporting the arguments that prevalence of food allergy at the rate 1-2% on yearly basis since last two to three decades. Incidence of food allergy is most common in children as compared to adults . There are some foods which are short listed for their prevalent allergic reactions particularly; peanut, shellfish, fish, cow's milk, eggs, seeds, soy and wheat are included in this group. Occurrence and prevalence of food allergy depends upon; dietary habits, difference in age and race, geographical variations, ethnicity and living standard (Sicherer & Sampson, 2014). According to estimation 8% children have exposure to food allergy, among them 2.4% suffer multiple types of food allergies and 3% are susceptible to severe allergic reactions. Every allergic food has its contribution in triggering allergic reactions. On Occurrence wise contributing proportion of cow's milk allergy is 2.2%, fruits 1.6%, peanut 1.8%, vegetables 1.3% and shellfish 1.9% .

Milk Allergy

Incidence of milk allergy is most frequent in children. Allergy induced by milk in children contributes about 20% proportions of all food based allergic reactions. Besides this, 2-5% children are having capability to synthesize IgE antibodies against intrusion of cow's milk and results in severe allergic response and anaphylaxis. Milk is second most entity responsible to aggravate anaphylaxis in human beings . However, due to intrinsic nutritional significance of milk it is rather difficult stance to eliminate milk completely for diet either they are child or adults. Cow milk is recommended frequently by child specialist as a replacement of mother's milk because of its higher lactose content. So, some of children become prone to cow milk allergy in early life and shows adverse symptoms. Cow milk proteins are responsible to induce life threatening symptoms. Similarly, children who are lacking lactase enzyme become susceptible to lactose intolerance. The prominent symptoms of lactose intolerance are diarrhea, vomiting, abdominal pain and bloating etc. Therefore, diagnostic studies are required to affirm either it is milk allergy or it is another ailment or allergic reactions. Serological and skin tests are carried out to confirm IgE mediated responses. So, foods supplemented with lactase enzyme are brought into introduction to mitigate that intolerance. Whereas, IgE mediated based reactions leads to development of serious anaphylaxis and life threatening situations like seizure of breathing. Symptoms of IgE mediated milk allergy include hives, eczema, cough, congestion, wheezing, vomiting, diarrhea, dizziness, hypotension and cramping. Abstinence from use of cow milk for intolerant patient is a sole way to avoid IgE mediated and IgE non-mediated allergic reactions . Hence, milk products containing allergens are listed in **table 3**.

Table 3: Milk products tends to be contained allergens

Milk and milk products exhibiting presence of milk

Condensed Milk, Malted Milk, Milk Protein, Buttermilk, Cheese, Butter, Milk Derivatives, Butter Fat, Butter Oil, Custard,

Egg Allergy

Proteins are present in abundance in egg and this is one of the main characteristics which make renowned to egg on world level and has increased its palatability to tremendous level. A technique naming cross immunoelectrophoresis has recognized 24 different types of proteins in egg; and that is big a figure to advocate utmost significance of egg in human life (Sicherer & Sampson, 2009). Incidence of egg allergy in infants is 2.4-2.6% during their early lives; either during or after lactation. Egg allergy is a factor for triggering severe anaphylaxis. The allergen entities in milk are ovalbumin and ovomucoid proteins. With respect to immunological response egg allergy is adverse in showing severity of allergic reactions. Consumption of eggs have become inevitable due to its nutritional significance; especially because of competent protein profile. Epidemiological data regarding egg allergy provide alarming statistics that 16% allergic reactions are contributed by egg allergy. Egg allergic reactions are provoked when egg proteins are recognized as foreign entity by immune system. This non acceptability behavior of immune system results in rejection response towards egg proteins. Allergic sensitization can results from both parts of eggs either it is egg

yolk or egg white. But in children the frequent cause of egg allergy is egg white i.e. egg proteins. In egg yolk there are three proteins, livetins, apovitelins and albumin which participate in promoting allergic reactions in human body. Among these livetins proteins are low-density lipoproteins. Apovitelins acts as major antigen in catalyzing egg allergy. The livetins and serum albumin are present in feathers, meat and egg of bird. In avian manifestation of allergic reaction is limited to egg and their meat is harmless with respect to allergic reactions. Appearance wise manifestation of allergic victims depends on its age, time of introduction to eggs and patterns of consumption either it is consumed as raw egg, yolk, egg white, cooked or partially cooked. The effect of egg allergic reaction is different on the basis of occurrence; whenever, an individual becomes victim to egg allergy there are 90% chances that it affect skin, 60% chances to be affect gastrointestinal tract and in there are 40% chances that it promote impairment in respiratory tract. The apparent symptoms of skin allergy are erythema, pruritus, urticaria, angio-oedema and rashes. In case of gastrointestinal allergy upper portion of digestive tract is likely to become affected and symptoms of gastrointestinal upset includes, abdominal pain, vomiting and nausea. The symptoms of respiratory ailment includes dyspnoea and rhinorrhoea. Implications of food allergy includes eosinophilic oesophagitis, proctocolitis and gastroenterocolitis. The clinical symptoms of gastroenterocolitis starts with the onset of vomiting while symptoms of enterocolitis appears after onset of vomiting. Eosinophilic oesophagitis aggravate the symptoms includes dysphagia, abdominal pain and vomiting (A. Martorell, E. Alonso, Boné, & L. Echeverría, 2013). Moreover, the egg proteins or products containing egg proteins are listed in **table 4**.

Table 4: Allergens containing egg proteins and products

Allergy Causing Eggs Proteins

Apovitelins, Albumin, Ovalbumin, Ovomucoid, Ovomucin, Ovoglobulin, Ovotransferrin, Ovovitellin, Ovovitelia Vitellin, Sim

Peanut Allergy

Peanut is consumed all over the world because of its high nutrition. Botanically, peanut is belonging to legume family and is related to lentils, peas and beans. Research based facts have shown that incidence of peanut allergy has increased to tremendous level last two to three decades. Proteins in a peanut are causing entities for food allergy. Round about 3% allergic reactions in children are caused by peanut. The severity of symptoms in peanut allergy varies from person to person. The most probable symptoms of food allergy include colicky abdominal pain, difficult breathing, dramatically fall in blood pressure severe asthma and swelling of interior lining of mouth or throat. Mild allergic reactions are common; and exhibit a mild manifestation which consists of vomiting, abdominal pain and hives. Peanut allergy can lead to anaphylaxis which can be life threatening for their victims. Throat swelling, difficulty in breathing and drop in blood pressure are symptoms of peanut allergy when it aggravates to a level of anaphylaxis. Moreover, anaphylaxis leads to unconsciousness, feeling of being collapsed and fear of something happening terrible. Anaphylaxis can cause death; but luckily, it is rare in occurrence. In case of severe anaphylaxis the patient is advised to introduce adrenaline auto-injector as an emergency treatment. Restrictive use of diet plan is key way to prevent attack of anaphylaxis which can result from food allergy. But, there is some sort of precautions regarding routine use of food. In case of using packed or labeled food consumer have to be conscious about ingredient of processed or labeled food. Sometimes manufacturers alter product recipe and there is probability that they may include food ingredient which can be a potential food allergen. Few and far between advisory labeling is recommended whenever there are chances that product may susceptible to cross contamination. So, it is responsibility of a consumer to assure avoidance from consumption of that product. Because, there are chances that during cross contamination allergens can also be in contact with a final product during processing . So, the foods containing peanut allergens are summarized in **table 5**.

Table 5: Food sources constituting peanut allergy

Allergen Containing Peanut Sources

Cakes and Puddings, Curry Pastes, Beer Nuts, Energy Mixes, Arachis Oils, Ice Creams, Desserts, Mixed Nuts, Monkey Nut

Sea Food Allergy

Usage of sea foods has a greater role in contributing world economy and human nutrition. Allergies due to shellfish and fish are common in existing era. Shellfish and fish are different sea products but both of them contain allergens which aggravate sea food allergy. The different types of shellfish which includes; crab, lobster, crayfish, prawns, shrimp, bivalves, gastropods and cephalopods contribute food allergy. Anaphylaxis induced by food allergen is going to be more frequent among nations of different underdeveloped and developed countries. The flesh of shellfish is responsible to contain allergens. Mostly people suffering from sea food allergy are advised to avoid skeletons and shellfish shells. Glucosamine is compound present in shells or skeletons of fish used in a treatment of different disease particularly arthritis. There are two sources for allergic reactions among sea foods; first one is non-immune mediated or contamination and second one is immune mediated allergic reactions. These non-immunological mediated allergic reactions are evoked by different contaminants namely; viruses, bacteria, parasites, toxins in sea and biological amines. Ingredients particularly spices which are added during processing and preservation of fish or other sea foods can trigger allergic reactions. The prominent allergen in shellfish is tropomyosin, myosin and arginine kinase. So, shellfish or fish allergy is a potentially increasing ailment which is responsible to initiate IgE mediated allergic responses. Classifications of sea oriented foods which are triggering anaphylaxis are described in **table 6**.

Table 6: Classification of sea foods triggering anaphylaxis

Phylum	Group	Common Name
Molluscs	Bivalves Gastropods	Mussel, Oyster, Scallop, Cockles, Clam Snail, Whelk, Abalone
Arthropods	Crustacean	Shrimp, Crab, Lobster, Prawn
Chordate	Teleost Cephalopods	Trout, Salmon, Tuna, Carp, Octopus, Squid

Wheat Allergy

Wheat (*Triticum aestivum*) is a widely grown cereal in the world and is a staple food for a dozen of countries. Because it makes basis for world diets and have intensive nutritional aspects. But, it is not astonishing to concede that it is interlinked with a symmetry of health based incompatibilities or disorders. Furthermore, that disorders could be cell-mediated, IgE or non-IgE oriented. Whereas, celiac disease belongs to cell-mediated reactions which have been classified as auto-immune disorders. The wheat protein gluten; is able to exert pathogenic role. So, this non-celiac gluten sensitization leads to development of an irritable bowel syndrome. Non-IgE mediated allergic reactions exhibit the symptoms of lymphocytic infiltration, chronic eosinophilic and gastrointestinal impairment. Celiac disease is also a result of non-IgE mediated response. Besides this, symptoms of IgE mediated allergic reactions are respiratory disorders and ultimately anaphylaxis. The prevalence of celiac disease is 0.6-0.8% with little bit fluctuation on worldwide level. Among pediatric populations prevalence of wheat allergy is showing increasing trend and varies from 0.5-1%. However, on the other hand wheat allergy in adults is rather rarer in existence. Wheat is unique in its physiochemical properties and has laid the several ways of allergenicity and can trigger outbreak of oral intolerance among atopic adult patients. The only and only treatment for individuals suffering from wheat allergy is avoidance or restrictive use of wheat or wheat products. There is a difference in wheat allergy and celiac disease in which intrusion of gluten free diet is an enough remedy. Initially, allergic reaction induced by wheat which reveals less severe symptoms including face swelling, hives and vomiting. Moreover, celiac disease is also an immune system disorder. In both, wheat allergy and celiac disease use of wheat is prohibited but for dissimilar

reasons. The food products which are indicator for presence of wheat are modified starch, soy sauce, natural flavoring, monosodium glutamate, vegetable gum, hydrolyzed vegetable protein and gelatinized starch. So, wheat can cause both IgE or non-IgE mediated reactions and occurrence of these reactions is due to ingestion and inhalation of wheat based allergens. In case of chronic allergic reactions it leads to anaphylaxis and Wheat-Dependent Exercise-Induced Anaphylaxis (WDEIA) . The prevalence of Wheat-Dependent Exercise-Induced Anaphylaxis can be decreased by increasing utilization of gluten free diet. There are two factors, physical exercise and ingestion of allergens which promote WEIDA. So, at present current recommendations regarding Wheat-Dependent Exercised Induced Anaphylaxis is the prohibition use of offending allergens . Hence, the food products containing wheat allergens and has recommended as avoidance product among victims are described in

table 7.

Table 7: Wheat containing products for which avoidance is recommended

Category of Product	Avoidance Recommended
Beverages	Instant Coffee, Malt, Beer, Malted Drinks, Wheat Based Cereal Drinks, Ale, Malted Milk, Mi
Confectionary Products	Candy Bars, Chocolate Candy, Commercial wheat containing candies
Dairy Products	Milkshakes containing wheat, Imitation cheeses, ice cream with candy or chocolate
Meat Products	Fish, Meat, Beef, Mutton and Poultry products coated with wheat bread crumb; cereal proces
Miscellaneous Products	Sauces or soy sauces thickened with wheat flour; Macaroni, Noodles, Spaghetti, and Pasta
Spices	Spices blended with Wheat flour, Malted Vinegars and Ketchups
Vegetable Products	Floured French Fries, Vegetable casseroles, Cereal containing puddings and soufflés
Fruit Products	Fruits mixed with wheat flour, bread crumb and fritters

Soy Allergy

Usage of soy is most common on globally basis because of its diverse functional profile and numerous health benefits. Frequent use of soybean rich diets lower the incidence of cancer, diabetes mellitus obesity and blood plasma cholesterol. However, soy lies among top ten foods which intrude allergic reactions among human beings. Soybean is ubiquitous in nature and usage; so, it has become difficult to sustain its avoidance among consumers completely . Hence, finding of soybean free food is a rather difficult task because of its diverse usage in innumerable food products. Multiple soy allergen reduction or elimination techniques are being attempted by investigators and these techniques includes enzymatic treatment, genetic engineering, thermal processing, ultrafiltration, irradiation, microwave, high pressure processing, powered ultrasound and ultraviolet light. The causal agent of soy allergy is proteins in nature and have identified as Gly m Bd 30K. That protein is known as oil-body associated glycoprotein which is composed of almost 257 amino acids. Approximately, 65% of soy allergy is recognized as atopic dermatitis among its susceptible . The diagnosis of soy allergy from accredited diagnostic institutions is important regarding reliability and authenticity of results. The quantification or detection of soy allergens in food samples is a rather tough nut to crack because of their presence in traces or either they have masked identity with giant food matrixes. Therefore, sometimes soy allergy is predominately denoted as hidden allergy. Immunochemical based assays are being employed in detection of soy allergens in a variety of food products. So, origin of soy antigens are protein based then Enzyme Linked Immunosorbent Assays (ELISA). Enormous number of food allergen investigator prefers to utilize ELISA as a detection technique in food commodities. ELISA has limited scope of identification because it can only perform qualitative estimation but on rarely basis protein got denatured due to some kind of certain interactions between antigen and antibody . The soy allergen containing food products are listed below in **table 8**.

Table 8: Food based soy derivatives inducing anaphylaxis

Food oriented soy allergy derivatives

Miso, Natto, Soy Curds, Soy Concentrate, Soy Grits, Soy Nuts, Soy Sauce, Soy Yoghurt, Tamari, Soy Cheese, Textured Soy

Tree Nuts

Tree Nuts are protruding cause of food allergy. The frequency of occurrence of nut allergy varies among countries because of diverse environmental circumstances and immunological responses of susceptible individuals. The seed storage proteins are prolific source of essential amino acids but are also source of intruding allergens in human beings. Allergic reactions particularly tree nut allergy are severe in occurrence and sometime can lead to life threatening concerns. Because of their healthy nutritional aspects of tree nuts the avoidance from their usage is rather difficult task to implement. While talking about nutritional aspects; frequent usage of tree nuts help in arresting Cardiovascular Diseases (CVDs) and blood cholesterol . Tree nuts are important as a protruding source of IgE-mediated responses. Due to these intense kinds of allergic reactions aggravated symptoms arose inevitably among victims. Whenever, after intake of tree nuts some sort of oral intolerance to those allergens would lead to production of IgE oriented antibodies which have the tendency to adhere IgE-oriented receptors antibodies on exterior lining of mast cells, monocytes, basophils and langerhans cells of atopic areas. Moreover, they have tendency to adhere a little bit low affinity IgE-mediated receptors. When allergens cross intestinal barrier they release prostaglandins, leukotrienes and histamines are released as a result of adverse reaction. So, these modulators induce contraction of smooth muscles, mucosal secretions and vasodilation. Inflammation is the manifestation of allergic reactions which is triggered by mast cells. Besides this, mast cells also release cytokines which are primarily inflammation facilitator which includes TNF- α , platelets, IL-4 and IL-5 . The prominent sources of peanut constituting allergen agents are demonstrated in **table 9**.

Table 9. The tree nuts promoting IgE-mediated Anaphylaxis

Common Name	Species	Family
Almond	<i>Prunus dulcis</i>	Rosaceae
Coconut	<i>Cocos nucifera</i>	Palmaceae
Brazil Nut	<i>Bertholletia excelsa</i>	Lecythidaceae
Peanut	<i>Arachis hypogea</i>	Leguminosae
Pine Nut	<i>Pinus pinea</i>	Pinaceae
Macadamia Nut	<i>Macadamia intergrifolia</i>	Proteaceae
Coconut	<i>Cocos nucifera</i>	Palmaceae
Pecan Nut	<i>Carya illinoensis</i>	Juglandaceae
Chestnut	<i>Castanea sativa</i>	Fagaceae
Walnut	<i>Juglans regia</i>	Juglandaceae
Pistachio	<i>Pistacia vera</i>	Anacardiaceae
Cashew Nut	<i>Anacardium occidentale</i>	Anacardiaceae
Hazel Nut	<i>Coryllus avellana</i>	Betulaceae

Conclusion

Anaphylaxis has evolved as a life threatening and sufferings prolonging phenomenon for humanity on global level. Its severe long lasting health symptoms create temperamental extremism in their victims. In current scenario an appealing need has evolved to take rectification measures for shrinking global burden of allergic ailments. Precautions especially restricted use of potential allergic foods is a sole and durable remedy to inhibit invasion of anaphylaxis. Because food allergy leading to anaphylaxis is a genetics oriented disorder. Manipulation of genetic pool is a second way out for getting rid of anaphylaxis; but it is uttermost complex in nature and extremely difficult to carried out. Moreover, processing and manufacturing of allergen free

food is a feasible entity but unfortunately can increase production cost of the product. So, most feasible and sustaining methodology for anaphylaxis avoidance is restricted use of allergen containing foods.

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We all authors of that paper declare that we have no conflict of interest among each other.

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Ethical Approval

This is a review article and involves no research oriented studies.