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Allergy and Clinical Immunotherapy

Anisha Sirram*

Department of Pharmacy, Navabharath Institute of Pharmaceutical and Medical Sciences, Hyderabad.

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*For Correspondence

Department of Pharmacy,
Navabharath Institute of
Pharmaceutical and Medical
Sciences, Hyderabad.

Email:

anishasirram29@gmail.com

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ABSTRACT

The bureau asthma attack tips recommend the utilization of patient-reported outcomes, together with health-related quality-of-life measures, to assess asthma attack management. Almost 40% of kids with nourishment hypersensitivity have a background marked by serious responses that if not treated instantly with fitting solution can prompt hospitalization or even passing. The National Institute of Allergy and Infectious Diseases (NIAID) assembled a specialist board in 2012 to create rules delineating proof based practices in diagnosing and overseeing sustenance unfavorable susceptibility.

Introduction

The hypersensitive immune responses to substances that either enter or come in contact with the body, such as pet dander, pollen grains, air pollutants, etc. are known as allergies. A substance that causes an allergic reaction is called an "allergen". Allergens can be found in food, drinks or the environment. Allergies occur once your immune system reacts to an overseas substance — like spore, bee venom or pet dander — that does not cause a reaction in the majority [1]. Your immune system produces substances called antibodies. Some antibodies defend you from unwanted invaders that might cause you to sick or cause infection [2].

When you have allergies, your system makes antibodies that establish a specific matter as harmful, even supposing it is not. After you get contact with the matter, your immune system's reaction will inflame your skin, sinuses, airways or system. One of the allergic symptoms is anaphylaxis. It is a severe, life-threatening, systemic hypersensitivity reaction that usually occurs rapidly after contact with an allergy-inducing substance [3]. Air borne food allergies are inconsistent, unavoidable, incurable and can be treated only through avoidance. The abnormal response to a food triggered by your body's immune system is a food allergy [4]. Top 8 allergens that cause food allergies are peanuts, milk, shellfish, tree nuts, eggs, fish, soy, wheat [5]. Some food allergens cause allergic rhinitis when the person eats the food to which he is allergic to; allergic rhinitis due to plant pollens is commonly called hay fever or seasonal allergy [6]. Standard classifications of allergic rhinitis is based on allergen exposure and thus was either considered perennial, with symptoms occurring year round, or seasonal, with symptoms occurring at a particular time of the year [7]. Asthma and atopic dermatitis are associated with allergic rhinitis. Both asthma and allergic rhinitis have same clinical conditions and are considered as chronic allergic respiratory syndrome [8] though allergic rhinitis is not a life-threatening condition. Adverse skin reactions occur due to side effects by drugs. Skin rashes can occur from a variety of factors, including

infections, heat, allergens, immune system disorders and medications. One of the most common skin disorders that cause a rash is atopic dermatitis, also known as eczema [9,10]. Atopic dermatitis is a common highly pruritic chronic inflammatory skin disease that occurs in children and is commonly known as eczema. Other causes of eczematous dermatitis include allergic contact dermatitis, irritant contact dermatitis, seborrheic dermatitis, nummular eczema, dyshidrotic eczema, asteatotic eczema, and lichen simplex chronicus [11]. Allergies can also cause hives which are outbreak of swollen, pale red bumps, patches, or welts on the skin [12]. The number of allergic conditions in people is increasing day by day in the industrialized world [13].

Types of Allergies:

Atopic Dermatitis:

It is also known as atopic eczema or eczema. People with AD usually have dry and scaly skin that spans the whole body, except maybe the diaper space, and intensely unquiet red, splotchy, raised lesions to make within the bends of the arms or legs, face, and neck [14]. These lesions then cry, crack, swell, and crust over. These lesions area unit at a heightened risk for microorganism, fungal or infectious agent colonization [15]. Atopy is an immediate-onset allergic reaction such as asthma, food allergies, AD or hay fever. The causes of hay fever can be genetic factors or the sanitary environment in which the children are grown [16]. There are various types of eczema listed below:

Allergic contact eczema: The skin gets red, itchy, and weepy because it touches something that the immune system knows is foreign, like poison ivy

Contact eczema: The skin has redness, itching, and burning in one spot because it has touched something allergy-causing, like an acid, cleaner, or other chemical.

Dyshidrotic eczema: The skin on the palms of hands and soles of the feet is irritated and has clear, deep blisters that itch and burn.

Neurodermatitis: Scaly patches on the head, lower legs, wrists, or forearms are caused by a localized itch (such as an insect bite) [17].

Nummular eczema: The skin has coin-shaped spots of irritation. The spots can be crusted, scaling, and very itchy.

Seborrheic eczema: This skin has yellowish, oily, scaly patches on the scalp, face, and sometimes other parts of the body.

Stasis dermatitis: The skin is irritated on the lower legs, most often from a blood flow problem [18].

Soaps, cleaners, dust or sand, cigarette smoke, perfumes, makeup and some substances such as chlorine, mineral oil, or solvents make eczema worse [19]. Stress, anger, and frustration can make atopic dermatitis worse, but they haven't been shown to cause it. Skin infections, temperature, and climate can also lead to skin flares. Other things that can lead to flares are: not using enough lubricants after a bath, low humidity in winter, dry year-round climate, long or hot baths and showers, going from sweating to being chilled, bacterial infections. According to the hygiene hypothesis, once youngsters area unit stated exposed to allergens within the setting at a young age, their system is additional doubtless to tolerate them, whereas youngsters stated in an exceedingly trendy "sanitary" setting area unit less doubtless to be exposed to those allergens at a young age, and, after they area unit finally exposed, develop allergies [20,21]. There's some support for this hypothesis with reference to AD.

Allergic rhinitis:

Rhinitis refers to inflammation of the nasal passages. This inflammation will cause a range of annoying symptoms, as well as innate reflex, itching, nasal congestion, runny nose, and symptom (the sensation that secretion is exhausting from the sinuses down the rear of the throat) [22]. Sometimes genetic factors tend to cause allergic rhinitis. Symptoms of allergic rhinitis worsen in children and in the people at the age of 30 and 40. The allergic reaction is characterized by activation of two types of inflammatory cells called mast cells and basophils. These cells produce inflammatory substances, such as histamine, which cause congestion (fluid to build up in the nasal tissues), itching, sneezing, and runny nose. Pollen, dust, animal dander (old skin), cat saliva, and mold are some of the allergens that cause allergic rhinitis [23]. Chances of allergic rhinitis in children are higher when mother have the symptoms. Airborne allergens that cause allergic rhinitis are: house dust mites feed on the dead flakes of human skin, pollen and spores, pet animal flakes of dead animal skin and their urine and saliva causes' allergic rhinitis [24,25].

Anaphylactic Shock:

It is a life-threatening allergic response that is marked by swelling, hives, lowered blood pressure, and dilated blood vessels. In case of severe anaphylaxis, a person will go into shock. If not treated immediately, it could lead to death [26]. Basophils cells play an important role in immediate allergic reaction and it represents less than 0.5% of the total leukocytes in peripheral blood, which makes their difficult and so some in vitro tests have been developed which detect their activation [27,28]. Basophils are increased during inflammatory responses such as certain types of skin inflammation, asthma or parasite infections. Both basophils and mast cells have common features and can play similar or overlapping roles, as well as have some distinct roles, in the induction of allergic diseases or in immune responses against parasites or ticks [29,30].

Asthma:

Asthma is a chronic inflammatory disease more common in infants and children those are sensitive to allergens and have increased responsiveness of trachea and bronchi to various stimuli. Current estimations suggest that 300 million people worldwide suffer from Bronchial Asthma and in addition 100 million may be diagnosed with Bronchial Asthma by 2025 [31]. Airflow obstruction in asthma is caused by constriction of bronchial smooth muscles and infiltration of leukocytes that fill the airways and induce epithelial damage and desquamation into the lumen of the airways [32]. Airway inflammation which is the main feature in asthma is caused due to the most prominent inflammatory cell eosinophil, with mast cells, lymphocytes, and macrophages [33,34]. Asthma and Chronic Obstructive Pulmonary Disease (COPD) are interlinked in which air flow obstruction is the common symptom [35,36]. In case of chronic asthma, formation of nasal polyps are observed which are not dangerous but cause blockage of normal drainage from the sinuses [37]. Tuberculosis can also leads to asthma in some patients who have inhaled *Cryptococcus* [38]. Airway inflammation which is the main feature in asthma is caused due to the most prominent inflammatory cell eosinophil, with mast cells, lymphocytes, and macrophages [39,40]. Dyspnea, cough, chest tightness and wheezing are the major symptoms of Asthma in children apart from airway inflammation and hyper responsiveness [41-43]. Asthma in some patients can be airborne due to allergen like the house dust mite in the domestic environment [44,45]. Increasing consumption of tobacco and other drugs like cannabis by the youngsters in India and other western countries has also been leading to the increased number of asthma cases as suggested by various studies to know the causes of asthma. Researchers have observed that tobacco smoke has caused chronic inflammation and airway hyperresponsiveness in mice [46-48].

Allergy caused by animals:

Cat cause allergies when the skin comes in contact with proteins in the cat's saliva, urine, and dander. People with allergies have oversensitive immune systems. Their bodies mistake harmless things like cat dander – for dangerous invaders, and attack them as they would bacteria or viruses. Outside cats can bring in pollen, mold, and other allergens on their fur [49]. Cockroaches can also cause allergies like asthma skin rash by allergens present in their body.

Food Allergy:

Food allergy occurs when the protein in the food makes harm to the body and its acts as the allergen. Some proteins or fragments of proteins are not broken down in the digestive process because they are resistant to digestion and are tagged by the Immunoglobulin E (IgE) [50]. Then the immune system sends the white blood cells to attack and that triggers an allergic reaction. Dermatitis, gastrointestinal and respiratory distress, including such life-threatening anaphylactic responses as biphasic anaphylaxis and vasodilation are the allergic responses of food allergy [51]. Cow's milk allergy is common in children in which casein, the solid milk protein and whey, the liquid part of milk can cause allergic reaction when the immune system is malfunctioned [52-55]. One of the most common food allergies is peanut allergy. Even traces of peanut or peanut butter can cause severe allergic reaction to eyes, nose and mouth [56,57]. Food allergy leads to eosinophilic esophagitis in both adults and children [58]. Allergy to egg proteins is common in some people when the body defends the entering of egg protein into the body and thus starts an allergic reaction [59-61].

Miscellaneous types of allergies:

Gluten allergy is caused by the protein gluten which causes severe damage to the small intestine. It helps in providing elasticity to baked food. Gluten is used in cosmetics, hair products, and other dermatological preparations [62,63]. It is also estimated that as much as 15% of the US population is gluten intolerant. Red meat allergy is one of the skin allergies caused by lone star tick, a tick that can cause people to develop an allergy to red meat, including beef and pork [64]. Physical urticaria is a severe heterogeneous disease associated with hives that make red or white itchy welts. Urticaria is not a life threatening condition but disturbs daily activities and sleep. Angioedema and urticaria are common in children in adults. Angioedema occurs on face, extremities or genitalia whereas urticaria can occur in any part of the body [65-67]. Eosinophil Cationic Protein is the activity indicator in allergic disease. Major source of tissue factors in chronic urticaria are eosinophils [68-70]. Some insects cause severe allergic reactions through the venom present in their saliva. They are: honeybees, hornets, yellow jackets and fire ants [71,72]. Latex allergy is a reaction between the natural latex found in the latex tree and skin. Reactions occur when the body comes in contact with latex and mistakes it with harmful substance [73,74]. Some drugs causes type IV delayed hypersensitivity also known as cell mediated immune reaction. It involves the interaction between T cells and antigens, the process takes more time so called as delayed type hypersensitivity [75,76].

Drug allergies are common in some individuals whose immune system overreacts to harmful substances when a drug enters into the body. Common drugs which cause allergies are antibiotics, such as penicillin, aspirin and non-steroidal anti-inflammatory medications, such as ibuprofen anticonvulsants, monoclonal antibody therapy and chemotherapy [77,78]. Buckwheat allergy is common in Japan and Korea among children because buckwheat is used to make pancakes [79]. Buckwheat contains highly potent allergens that trigger allergic reactions via an IgE mediated response; the release of histamine into the blood causes severe allergic reactions [80,81]. Contact dermatitis is one of the skin allergies causing inflammation when any foreign substance enters into the epidermis of the skin and causes inflammation in the layer beneath the epidermis [82,83]. Temporary tattoos and body art containing henna have lasting consequences and patient had showed type IV delayed hypersensitivity because of black henna [84].

Therapy

Treatment is based on age, symptoms and general health. Medications include skin creams or ointments that control swelling and lower allergic reactions, corticosteroids, antibiotics to treat infections caused by bacteria, antihistamines that make people sleepy to help stop nighttime scratching, drugs that suppress the immune system. Antidepressants and naltrexone may be used to control pruritus [85,86]. Antihistamines used to treat allergy symptoms fall into two broad categories: sedating and non-sedating. The first category includes the older antihistamines. These allergy drugs relieve allergy symptoms but cause drowsiness and other side effects, including dry mouth. Newer antihistamines are said to be non-

sedating, although some users may experience drowsiness even from these. Antihistamines treat swelling, tearing, itching, and increase in bronchial and other secretions [87]. 90% of children cured from atopic dermatitis by shower therapy, avoidance of triggering factors and optimal skin care are the basic therapy for AD in children [88]. Atopic dermatitis can also be treated with moisturizers with anti-inflammatory actions and are classified as occlusives, humectants, and emollients [89,90]. Ointments, which are 80 percent oil and 20 percent water, trap skin's moisture the best. Creams are 50 percent oil and 50 percent water and the next most effective. Lotions are more water than oil, so they lock in the least amount of moisture. Each product has its own place. When humidity is high, skin loses less moisture and a lotion might be all you need; on the other hand, when the air's very dry, the richness of an ointment may be better [91-93]. Moisturizers with anti-inflammatory properties for reducing itching and redness in Atopic dermatitis are aloe barbadensis leaf powder which has anti-inflammatory, anti-pruritic, analgesic and wound healing properties. Bisabolol which has anti-inflammatory and anti-spasmodic properties [94,95]. Zinc gluconate which treats inflammatory skin diseases such as acne vulgaris. Emollients improve skin conditioning and satisfies the consumer by giving a smooth, softness and flexibility. Emollient alcohols such as cetyl, stearyl, octyl dodecanol, hexyl dodecanol and oleyl alcohol, give a smooth texture to skin [96]. Immunotherapy, or allergy shots, may be the most effective form of treatment if you suffer from allergies more than three months of the year [97-99]. Immunotherapy is recommended in patients when the symptoms are intolerable and medications fail to show any action. Severe symptoms can be reduced by immunotherapy [100,101]. These shots expose you to gradually increasing levels of the offending allergen to help your immune system build tolerance [102]. Common drugs for Allergy treatment includes: cetirizine, astemizole, beclomethasone, epinephrine [103]. Mast cell stabilizers help prevent allergic reactions from happening when taken regularly. During an allergic reaction, mast cells release histamine and other substances. Mast cell stabilizers, such as cromolyn sodium, keep these cells intact. Basophil activation is used in some severe drug allergies [104,105]. Montelukast and levocetirizine provide quick relief in the case of allergic rhinitis [106,107]. Allergy shot treatment involves two phases. The first phase involves frequent injections of increasing amounts of allergen extract. This is followed by a maintenance phase, during which the injections are given about once a month. Sublingual immunotherapy is much preferred nowadays rather than allergy tablets in which the allergens are administered in liquid or tablet form on a daily basis [108,109]. Epinephrine auto injector is the commonly used medical device to treat anaphylaxis. Epinephrine (adrenaline) to reduce your body's allergic response [110,111]. Oxygen helps to compensate for restricted breathing. Intravenous (IV) antihistamines and cortisone reduces inflammation of your air passages and improve breathing. A beta-agonist (such as albuterol) relieves breathing symptoms [112]. Hypersensitivity brought on by creatures can be counteracted by taking the preventive measures like Get tried. An anaphylaxis authority can focus the precise wellspring of your unfavorably susceptible responses by a basic prick of the skin on your arm or back [113]. Take your medication. Over-the-counter or medicine antihistamines, decongestants, eye drops and airborne inhalers will help lessen the manifestations, in spite of the fact that they don't kill the hypersensitivity [114]. In the event that you want to take an all-encompassing methodology, attempt Nettle tea, a bioflavonoid called quercetin or needle therapy. In late studies cell reinforcements, for example, Vitamins C and E have shown noteworthy hostile to allergen impacts [115-117]. Asthma can be managed efficiently by two therapies that are pharmacotherapy and non-pharmacotherapy. Pharmacotherapy includes long-term control oral and inhaled medication like bronchodilators, mast cell stabilizers, corticosteroids, β -agonists, leukotriene modifiers and immunotherapy [118-120]. Management of asthma can be improved by the treatment of allergic rhinitis, symptomatic gastro esophageal reflux disease (GERD), vocal cord dysfunction, obstructive sleep apnea, obesity, anxiety and depression [121]. Bronchial thermoplasty is the procedure to treat airflow obstruction and bronchoconstriction in COPD and severe asthma [122,123]. There are lots of medicines in homeopathy for asthma symptoms and it is not possible to list them all here. Some of the common medicines are ars-alb, ipecac, lachesis, pulsatilla, spongia, sulphur, ignatia, antim-tart, hepar-sulph, nat-sulph, tuberculinum etc. [124,125]. Bronchodilators and steroids do not help the body improve its response to allergens (irritants) or simply fail to improve the faulty immune mechanism [126]. Omalizumab an anti-IgE monoclonal antibody is the first biologic immunoregulatory agent available to treat asthma. It acts by binding to the portion of IgE that recognizes its receptor on the surface of mast cells and basophils and, when given intravenously, reduces circulating IgE levels by 95% [127,128]. Transdermal administration could be regarded as the third route of steroid therapy for asthmatic cough though less effective

compared to inhaled corticosteroid therapy [129,130]. Non-pharmacotherapy techniques include Yogic techniques i.e., Asana (Physical exercises) and Pranayama (Breathing exercises) [131,132]. Transdermal administration could be regarded as the third route of steroid therapy for asthmatic cough though less effective compared to inhaled corticosteroid therapy [133]. Allergy treatment can be improved by allergen immunotherapy which involves the regular administration of gradually increasing doses of allergen extracts over a period of years. Sublingual immunotherapy can be given to patients as an injection or as drops or tablets under the tongue [134]. High dose of vitamin D3 reduces the hives caused by urticaria and somatosensory amplification is also used nowadays to treat chronic urticarial [135,136]. Clinical immunotherapy is the effective treatment to treat allergies and cancer in which interleukin-2, vaccines and interferons are used which modifies the body's immune system to produce more T-cells which are white blood cells that fight disease [137,138]. In allergen specific therapies, oral, sublingual, and cutaneous immunotherapy (desensitization), mutated recombinant proteins are included. These are deficient in their Ig-E binding activity so are co-administered with heat-killed Escherichia coli to generate maximum immune response [139-142]. Spirometry is the test used to check lung functions and the amount of air we inhale and also to diagnose asthma and chronic obstructive pulmonary disease (COPD) [143-146]. Proton pump inhibitors reduce the effects caused by food allergy by reducing the production of acid by blocking the enzyme in the wall of the stomach that produces acid. Proton pump inhibitors therapy should be used to treat eosinophilic esophagitis [147-149]. Skin prick test is the safest method in some people with bad eczema and allergic rhinitis [150].

CONCLUSION

Health care professionals dealing with this disease being open minded about what constitutes optimal therapy will result in improved control and prevention of pediatric asthma. Conception companion studies with a long stretch of subsequent demonstrated that some extraordinary nourishment unfavorable susceptibilities can be an indicator of asthma sometime down the road. Sustenance anaphylaxis has been embroiled as a danger element forever debilitating asthma and asthma likewise is by all accounts a danger component forever undermining nourishment hypersensitivity.

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