Atopic Dermatitis (Eczema), Contact Dermatitis, Food Allergy, and Ocular Allergy in Children

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Abstract

Allergic disorders in childhood represent a major health burden worldwide, commonly manifesting as atopic dermatitis, contact dermatitis, food allergy, and ocular allergy. These conditions often coexist as part of the "allergic march," in which early skin barrier dysfunction may predispose children to later allergic diseases. Atopic dermatitis is a chronic inflammatory skin disorder characterised by pruritus and recurrent eczematous lesions. Contact dermatitis results from direct exposure to irritants or allergens and causes localised inflammation. Food allergy involves an abnormal immune response to dietary proteins and may range from mild cutaneous symptoms to life-threatening anaphylaxis. Ocular allergy encompasses conjunctival inflammation caused by environmental allergens, leading to itching, redness, and tearing. Early recognition and appropriate management are essential to reduce morbidity, improve quality of life, and prevent complications in affected children.

Keywords: *atopic dermatitis; eczema; contact dermatitis; food allergy; ocular allergy; children; pediatric allergy.*

1. Introduction

Allergic diseases are among the most common chronic conditions in children. The prevalence of pediatric allergies has increased significantly over recent decades due to genetic, environmental, and lifestyle factors, with the skin, gastrointestinal tract, and ocular system being the most frequently involved organ systems.

Children with one allergic condition are at increased risk of developing additional allergic diseases. Infants with atopic dermatitis, for instance, may later develop food allergies, allergic rhinitis, or asthma — a progression referred to as the allergic march. Understanding these interrelated disorders helps clinicians provide timely diagnosis and effective, coordinated treatment.

2. Atopic Dermatitis (Eczema)

2.1 Definition

Atopic dermatitis is a chronic, relapsing inflammatory skin disease characterised by dry skin, severe itching, red inflamed lesions, and recurrent exacerbations. It usually begins in infancy and affects up to 20% of children worldwide, making it the most prevalent chronic inflammatory skin disorder in pediatric populations.

2.2 Etiology

The pathogenesis of atopic dermatitis is multifactorial, involving the following contributing factors:

- Genetic predisposition and family history of atopy
- Skin barrier dysfunction, including mutations of the filaggrin gene that impair epidermal integrity and increase allergen penetration
- Immune dysregulation with a predominant Th2-mediated inflammatory response
- Environmental triggers including allergens, irritants, and microbial colonisation

2.3 Clinical Features

The distribution of lesions varies with age. In infants, eczema typically affects the cheeks, scalp, and extensor surfaces. In older children, involvement shifts to flexural areas, the neck, wrists, and ankles. Common symptoms include intense itching, dry skin, lichenification, sleep disturbance, and susceptibility to secondary bacterial infection.

2.4 Diagnosis

Diagnosis is clinical, based on the presence of chronic or recurrent itching, a characteristic distribution of lesions, and a personal or family history of atopy. No single diagnostic test is required or sufficient.

2.5 Management

Treatment is stepwise and includes:

- Regular application of emollients to restore skin barrier function
- Topical corticosteroids for active inflammatory lesions
- Topical calcineurin inhibitors (tacrolimus, pimecrolimus) as steroid-sparing agents
- Antihistamines for symptomatic relief of pruritus
- Identification and avoidance of individual trigger factors
- Prompt treatment of secondary skin infections

3. Contact Dermatitis in Children

3.1 Definition

Contact dermatitis is a localised inflammatory reaction of the skin caused by direct contact with an external substance. Two distinct types are recognised: irritant contact dermatitis, which results from non-immunological damage by chemical or physical agents, and allergic contact dermatitis, which is a delayed-type (Type IV) hypersensitivity reaction to a specific allergen.

3.2 Common Causes

Frequent triggers in children include soaps, detergents, nickel (jewellery, belt buckles), fragrances, latex and rubber, cosmetic preservatives, and plant-derived allergens. Diaper

dermatitis is a common form of irritant contact dermatitis in infants.

3.3 Clinical Features

Symptoms include redness, swelling, itching, burning sensation, vesicle formation, and crusting. Characteristically, lesions are confined to the area of direct contact with the offending substance, which aids diagnosis.

3.4 Diagnosis

Diagnosis relies on a detailed history of allergen or irritant exposure, physical examination of the distribution and morphology of lesions, and — in suspected allergic contact dermatitis — standardised patch testing to identify specific sensitisers.

3.5 Treatment

Management involves removal of the causative agent, skin barrier protection with moisturisers, topical corticosteroids for active inflammation, and structured education of parents regarding avoidance strategies and skin care.

4. Food Allergy in Children

4.1 Definition

Food allergy is an adverse immune-mediated reaction to one or more dietary proteins. The eight most common allergenic foods — cow's milk, eggs, peanuts, tree nuts, soy, wheat, fish, and shellfish — account for the majority of reactions in childhood.

4.2 Pathophysiology

Food allergic reactions are classified as IgE-mediated (immediate hypersensitivity), non-IgE-mediated (delayed cell-mediated), or mixed. IgE-mediated reactions occur rapidly after ingestion, typically within minutes to two hours, and are associated with the greatest risk of anaphylaxis.

4.3 Clinical Features

Symptoms may affect multiple organ systems simultaneously. Cutaneous manifestations include urticaria, angioedema, and worsening eczema. Gastrointestinal features include vomiting, diarrhoea, and abdominal pain. Respiratory involvement may produce wheezing, cough, and nasal congestion. In its most severe form, food allergy presents as anaphylaxis — a life-threatening systemic reaction requiring immediate intervention.

4.4 Diagnosis

A comprehensive diagnostic approach includes a detailed dietary and symptom history, skin prick testing, measurement of specific serum IgE levels, a supervised elimination diet, and — where necessary — a standardised oral food challenge conducted in a clinical setting.

4.5 Management

The cornerstone of management is strict avoidance of the offending food, combined with nutritional counselling to prevent dietary deficiency. All patients with confirmed food allergy

should have a written emergency action plan and be prescribed self-injectable epinephrine, which is the first-line treatment for anaphylaxis. Antihistamines are appropriate for mild reactions but must not delay epinephrine administration in severe cases.

5. Ocular Allergy in Children

5.1 Definition

Ocular allergy refers to a spectrum of allergic inflammatory disorders affecting the conjunctiva and, in severe forms, the cornea. The main subtypes are seasonal allergic conjunctivitis, perennial allergic conjunctivitis, vernal keratoconjunctivitis, and atopic keratoconjunctivitis.

5.2 Common Causes

Triggers include airborne allergens such as pollen, dust mites, animal dander, and mold spores. In seasonal allergic conjunctivitis, symptoms are temporally linked to specific pollen seasons, while perennial forms are driven by year-round indoor allergens.

5.3 Clinical Features

The hallmark symptom is intense ocular itching, accompanied by redness, excessive tearing, burning sensation, photophobia, and eyelid swelling. In vernal keratoconjunctivitis, cobblestone-like papillae on the upper tarsal conjunctiva and corneal involvement may threaten vision.

5.4 Diagnosis

Diagnosis is based on clinical symptoms, a history of allergen exposure, and slit-lamp biomicroscopy. Allergen-specific IgE testing or skin prick testing may support identification of the causative allergen.

5.5 Treatment

Management includes cold compresses and artificial tears for symptomatic relief, topical antihistamine eye drops, dual-action antihistamine/mast cell stabiliser agents, and strict allergen avoidance. Severe or vision-threatening cases require ophthalmology referral and may necessitate short-course topical corticosteroids under specialist supervision.

6. Relationship Between Allergic Disorders

These four conditions frequently overlap and may represent sequential or concurrent manifestations of atopic disease. Children with atopic dermatitis are at significantly elevated risk of developing food allergy; both conditions share a mechanism of impaired epithelial barrier function that promotes allergen sensitisation. Ocular allergy commonly coexists with allergic rhinitis and may be exacerbated by the same aeroallergens that drive skin and airway disease.

The allergic march — from early-onset eczema and food allergy in infancy to later development of rhinitis and asthma — underscores the importance of early, proactive management at each stage to reduce the risk of subsequent disease progression.

7. Prevention

Evidence-based preventive strategies include:

- Exclusive breastfeeding for at least four to six months of life
- Regular skin hydration in infancy to maintain epidermal barrier integrity
- Avoidance of unnecessary restriction of allergenic foods in early infancy — current evidence supports early dietary introduction
- Reduction of indoor allergen burden through environmental control measures
- Early medical consultation when atopic symptoms are first identified
- Structured parent education regarding recognition of allergic symptoms and appropriate first response

Early, targeted intervention can meaningfully reduce the severity of individual allergic conditions and may attenuate progression along the allergic march.

8. Conclusion

Atopic dermatitis, contact dermatitis, food allergy, and ocular allergy are prevalent and often interrelated chronic allergic disorders that significantly affect children's health and quality of life. Each condition has a distinct but partially overlapping pathophysiology, clinical presentation, and management approach. Early diagnosis, evidence-based treatment, and preventive strategies can substantially improve long-term outcomes. A multidisciplinary approach involving pediatricians, dermatologists, allergists, and ophthalmologists is frequently necessary to deliver comprehensive, coordinated care.

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