Allergopedia

Clinical Protocols in Pediatric Allergy

Equipping the Next Gen in Allergy Care

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Management of Asthma in Children and Adults

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INTRODUCTION

Asthma is one of the most common chronic respiratory conditions affecting children worldwide and represents a significant cause of morbidity, school absenteeism, and healthcare visits. Its presentation and management can vary widely due to underlying genetic, environmental, and social factors. Recognizing this, several international and national bodies have developed structured guidelines to aid in the diagnosis and management of asthma in pediatric populations. Notable among these are the Global Initiative for Asthma (GINA), the National Asthma Education and Prevention Program (NAEPP) in the United States, the British Thoracic Society/Scottish Intercollegiate Guidelines Network (BTS/SIGN), the Canadian Thoracic Society guidelines, and the Australian Asthma Handbook. While these documents share core principles—such as symptom-based assessment, stepwise pharmacotherapy, and the emphasis on long-term control—there are differences in their approach, particularly in age-specific recommendations, medication choices, and diagnostic tools.

Among these, the GINA guidelines are widely recognized and adopted across different regions for their evidence-based, regularly updated, and globally applicable recommendations. In India, GINA serves as the principal reference for pediatric asthma care, with endorsement from several national pediatric respiratory and allergy societies such as the IAP National Respiratory Chapter and the Pediatric Allergy Association of India. However, implementing these guidelines in the Indian context presents unique challenges which include clinical, socio-cultural, and systemic factors. Hence, while the GINA guidelines offer a valuable framework, their application in India requires thoughtful adaptation to address local healthcare realities. This chapter reviews the stepwise approach to managing pediatric asthma as outlined in the GINA 2025 update and explores how these strategies can be effectively tailored to the Indian setting.

Driven primarily by a chronic Th2-mediated inflammatory response, the management of asthma focuses on three key aspects:

1. *Acute management* of wheezing episodes
2. *Long-term control* of underlying airway inflammation
3. *Addressing comorbid conditions.*

GOALS OF LONG-TERM ASTHMA MANAGEMENT

The primary objectives of long-term asthma care include:

- Achieving and maintaining good symptom control
- Optimizing pharmacotherapy to balance effective control with minimal side effects
- Supporting normal levels of activity and ensuring restful sleep

GLOBAL INITIATIVE FOR ASTHMA-BASED STRATEGY FOR LONG-TERM MANAGEMENT

According to the GINA guidelines, a structured, three-step approach is recommended:

- *Assess:* This involves confirming the diagnosis of asthma, evaluating current symptom control, monitoring treatment response, and reviewing inhaler use and technique.
- *Adjust treatment:* Based on the level of control, treatment is either stepped up (when symptoms are not well-controlled) or stepped down (when good control is maintained).
- *Review response:* Ongoing reassessment is essential to evaluate treatment efficacy, detect side effects and modify therapy as needed.

INITIATION OF TREATMENT

In children who present with recurrent wheezing triggered by identifiable factors, diagnostic evaluation—including peak expiratory flow rate (PEFR), spirometry, and challenge testing—is essential to confirm asthma. Once diagnosed, symptom categorization is performed based on:

- *Daytime symptoms*
- *Nighttime (nocturnal) symptoms*
- *Frequency of short-acting beta-agonist (SABA) use*
- *Limitations in physical activity*

This classification helps determine the level of asthma control, which is categorized as:

- *Well-controlled asthma*
- *Partly controlled asthma*
- *Uncontrolled asthma*

MANAGEMENT GUIDELINES

Personalized Asthma Management—Global Initiative for Asthma 2025 Approach

The cornerstone of asthma care, as emphasized in *GINA 2025*, is *personalized asthma management*. The primary goal is to achieve and maintain optimal *symptom control*, prevent exacerbations, and minimize future risk, including airway remodeling.

This process involves two key phases:

1. *Initiation of appropriate therapy* based on the individual's level of symptom control and risk profile.
2. *Ongoing treatment adjustment* through a stepwise approach—stepping up treatment when control is poor and stepping down when good control is achieved and sustained.

COMPONENTS OF ASTHMA PHARMACOTHERAPY

Asthma treatment includes two major therapeutic components.

Maintenance Therapy

Focused on long-term control of airway inflammation, promoting healing, and preventing structural changes (airway remodeling). The primary agent remains *inhaled corticosteroids (ICS)*, which are the foundation of controller therapy.

Reliever Therapy

Aimed at providing quick relief during episodes of bronchospasm or acute symptoms. Options include:

- *Short-acting beta-2 agonists*—traditionally used as quick-relief medications.
- *Low-dose ICS–formoterol*—increasingly recommended in older children and adolescents as both *reliever* and *controller*, offering anti-inflammatory benefit with rapid onset.

THERAPEUTIC STRATEGIES COMBINING MAINTENANCE AND RELIEVER THERAPY

Global Initiative for Asthma 2025 outlines several flexible treatment models based on patient characteristics:

- *Maintenance and reliever therapy (MART):* The same combination of *low-dose ICS and formoterol* is used for both daily maintenance and as-needed symptom relief. This approach is recommended for individuals ≥12 years and children aged 6–11 years where appropriate, especially in those with moderate-to-severe asthma or frequent exacerbations.
- *Anti-inflammatory reliever (AIR):* In patients with *mild asthma*, daily maintenance therapy may not be needed. Instead, *as-needed low-dose ICS–formoterol* is used to relieve symptoms and provide anti-inflammatory action during exacerbations. This strategy reduces the risk of over-reliance on SABA.
- *Separate maintenance and reliever therapy:* In younger children (especially <6 years), where ICS–LABA combinations are not approved as relievers, treatment typically consists of:
  - A *daily controller* (usually ICS or ICS + leukotriene receptor antagonist)
  - A *separate reliever*, usually *SABA* as needed

  This approach remains standard in preschool children due to age-specific medication approvals and developmental considerations.

STEPWISE LONG-TERM MANAGEMENT OF ASTHMA—GLOBAL INITIATIVE FOR ASTHMA 2025

Asthma management is tailored according to *age groups*, with specific stepwise algorithms:

- *Adolescents and adults (≥12 years):* Emphasis on ICS–formoterol as both MART or as-needed ICS–formoterol (AIR) in mild asthma. Traditional SABA-only strategies are no longer preferred due to increased risk of exacerbations.
- *Children aged 6–11 years:* Stepwise management includes ICS monotherapy, ICS + LABA, or MART where appropriate. Use of ICS–formoterol as a reliever is now supported in selected children.
- *Children <5 years (preschool wheezers):* Diagnosis is often clinical. Management depends on phenotype (e.g., episodic viral wheeze vs. multi-trigger wheeze), frequency of symptoms, and exacerbation history. Treatment involves low-dose ICS or montelukast for controller therapy, with SABA as the primary reliever.

Adolescents (>12 years)

Asthma management in adolescents follows principles similar to adult care, with an emphasis on *anti-inflammatory treatment even in mild disease*, abandoning the previous SABA-only approach. Adolescents are at increased risk of poor adherence, underreporting symptoms, and psychosocial factors affecting disease control. In the GINA 2025 guidelines for individuals aged 12 years and above, asthma management is structured into two tracks based on the choice of reliever medication. *Track 1*, which is the *preferred approach*, uses a combination of low-dose *inhaled corticosteroid (ICS)–formoterol* as both the controller and reliever. This approach provides better protection against severe exacerbations by addressing airway inflammation even during symptom relief. *Track 2*, the alternative option, uses a *SABA* as the reliever, alongside a regular maintenance controller such as ICS or ICS-LABA. Track 1 is prioritized due to its superior efficacy in reducing the risk of severe attacks and its simplified, flexible regimen that aligns better with real-world use patterns.

Stepwise Treatment (Steps 1–5)

- *Step 1:* As-needed low-dose ICS–formoterol is preferred for patients with infrequent symptoms. This "anti-inflammatory reliever" (AIR) strategy ensures that even mild asthma receives anti-inflammatory therapy during exacerbations, reducing reliance on SABA and preventing severe attacks.

- *Step 2:* Daily low-dose ICS with as-needed SABA, or as-needed low-dose ICS–formoterol (AIR), is recommended. The AIR strategy remains preferable due to better safety and fewer exacerbations.
- *Step 3:* Low-dose ICS–LABA as maintenance therapy with SABA as reliever, or low-dose ICS–formoterol used for both maintenance and relief (MART). MART simplifies treatment and improves adherence.
- *Step 4:* Medium-dose ICS–LABA (maintenance) with either SABA or low-dose ICS–formoterol as reliever. MART continues to be an option for eligible patients.
- *Step 5:* Referral for specialist evaluation. Consider add-on therapies such as tiotropium, biologics [e.g., anti-immunoglobulin E (anti-IgE) or anti-IL-5 agents], and phenotyping for severe asthma.

Monitoring and Step Adjustment

Treatment should be adjusted based on symptom control and risk reduction. Step-up is warranted for poor control, whereas a step-down should be considered after 3 months of good control. Regular review of inhaler technique and adherence is essential.

Children Aged 6–11 Years

Asthma in this age group requires a developmentally sensitive approach, considering the child's ability to use inhaler devices and adhere to therapy. GINA 2025 reflects an evolving paradigm that introduces anti-inflammatory reliever strategies in selected children.

Stepwise Treatment (Steps 1–5)

- *Step 1:* As-needed low-dose ICS taken with SABA at symptom onset is preferred. Alternatively, daily low-dose ICS may be started if symptoms occur more than twice a month.
- *Step 2:* Daily low-dose ICS with SABA as needed. A leukotriene receptor antagonist (LTRA) may be used in patients with poor ICS tolerance or allergic rhinitis, though efficacy is lower.
- *Step 3:* Low-dose ICS–LABA maintenance therapy with SABA as reliever. Alternatively, very low-dose ICS–formoterol as MART may be used in selected children who can manage the inhaler and demonstrate consistent symptom patterns. Another option is to use medium dose ICS maintenance therapy.
- *Step 4:* Medium-dose ICS–LABA or continue MART with a higher ICS dose if needed. Specialist referral should be considered for poor responders or frequent exacerbations.
- *Step 5:* Evaluation for severe asthma. Add-on biologics may be considered after confirming diagnosis, addressing modifiable factors, and assessing phenotypes.

Monitoring and Follow-up

Regular follow-up visits should assess symptom control, adherence, side effects, growth parameters, and psychosocial factors. Step-down therapy should be considered when control is sustained for at least 3 months.

Children Under 5 Years

Asthma diagnosis and management in preschool children are particularly challenging due to developmental limitations, overlapping viral wheeze syndromes, and the absence of reliable pulmonary function testing. GINA 2025 recommends a pragmatic, phenotype-driven, and response-based approach in this age group.

Stepwise Treatment (Steps 1–3)

- *Step 1:* Infrequent wheezing episodes (less than every 6–8 weeks and mild) may be managed with SABA alone. If the child is at risk of exacerbations, intermittent high-dose ICS for

7–10 days during episodes may be considered, though this should be used cautiously.

- *Step 2:* Daily low-dose ICS is the preferred controller therapy for persistent symptoms or frequent episodes. LTRA may be considered if there is poor ICS tolerance or coexisting allergic rhinitis.
- *Step 3:* Consider doubling the ICS dose or adding LTRA. Children who fail to respond should be referred to a specialist for reevaluation and to exclude alternative diagnoses.

Monitoring and Review

Monitor growth closely due to the systemic effects of ICS. Educate caregivers about proper inhaler technique and medication adherence. Reassessment every 3–6 months is recommended to decide on treatment adjustment or potential discontinuation in cases of sustained remission.

BIOLOGICALS IN PEDIATRIC ASTHMA

When conventional therapies fail despite rigorous adherence checks and comprehensive multidisciplinary evaluation, biologic agents become an option. These therapies are typically reserved for children with either truly severe, treatment-resistant asthma or those with refractory disease, where standard management flaws have been addressed to no avail.

Five biologics are currently licensed for pediatric use, although data from children, especially those <12 years, remains sparse compared to adults. These include omalizumab, mepolizumab, dupilumab, benralizumab, and tezepelumab. Of these, omalizumab is the most extensively studied in pediatric populations. The efficacy of these drugs is largely determined using biomarkers such as peripheral blood eosinophil count and fractional exhaled nitric oxide (FeNO), although these values vary naturally in children and are affected by infections and corticosteroid use.

Omalizumab: Anti-immunoglobulin E Therapy

Omalizumab, the first biologic approved for pediatric asthma, targets circulating IgE, thereby preventing its interaction with receptors on mast cells and basophils. This reduces mediator release and allergic inflammation.

As per GINA 2025, omalizumab should be considered in children aged ≥6 years with moderate-to-severe allergic asthma that is uncontrolled despite optimized inhaled therapy, and who have evidence of sensitization to perennial aeroallergens along with elevated serum IgE levels within the dosing range for omalizumab. The child should have a history of frequent exacerbations or persistent symptoms, and treatment should follow a confirmed diagnosis with assessment of adherence and inhaler technique.

Dosing is weight and IgE-dependent, and response is typically assessed after 16 weeks. Though considered safe, rare side effects include serum sickness-like reactions, thrombocytopenia, and unmasking of eosinophilic granulomatosis with polyangiitis following oral corticosteroids (OCS) tapering.

Mepolizumab: Anti-Interleukin-5 Therapy

Mepolizumab was the second biologic to gain approval for children. It works by binding to interleukin-5 (IL-5), a key driver of eosinophilic inflammation, thereby reducing eosinophil activation and survival. It is licensed for children 6 years and older with elevated eosinophil counts (usually >300–400 cells/μL) and a history of multiple exacerbations or prolonged OCS use. Dosing is 40 mg for children aged 6–11 years and 100 mg for those 12 years or older, administered every 4 weeks. Treatment continuation is typically based on reduction in exacerbation frequency or tapering of OCS.

Despite its established role, various studies have suggested that mepolizumab is less effective in children than in adults. Potential reasons include different inflammatory pathways, environmental factors such as air pollution, and the possibility that IL-5 plays a less prominent role in pediatric asthma. These findings emphasize that adult data should not be directly extrapolated to younger populations.

Dupilumab

Dupilumab is a monoclonal antibody approved for use in children aged 6 years and older with moderate-to-severe asthma characterized by type 2 inflammation, as defined by elevated eosinophils or FeNO. According to GINA 2025, it is considered an add-on therapy for patients who remain uncontrolled despite optimized standard treatment, including high-dose ICS-LABA. Dupilumab targets the IL-4 receptor alpha, thereby inhibiting both IL-4 and IL-13 signaling, which are key drivers of type 2 inflammation. Clinical trials have shown improvements in asthma control, lung function, and reduction in exacerbations in pediatric patients with appropriate biomarkers. It is particularly beneficial for children with co-existing severe eczema. Dupilumab increases nitric oxide synthesis in airways, making FeNO a useful biomarker for predicting response. Dosing varies by age and weight, with biweekly or monthly subcutaneous injections depending on these parameters. Response is evaluated after 16 weeks.

Tezepelumab

Tezepelumab represents a significant advance as it is effective even in non-TH2 asthma phenotypes. It blocks thymic stromal lymphopoietin (TSLP), an epithelial-derived cytokine involved in initiating and amplifying airway inflammation. TSLP acts upstream in the inflammatory cascade, affecting both TH2 and non-TH2 pathways. Tezepelumab is licensed for children aged 12 years and older with uncontrolled asthma despite high-dose ICS and additional therapy. Unlike other biologics, it does not require elevated eosinophils or FeNO for initiation.

Adverse Effects of Biologicals

Biological therapies have emerged as a significant advancement in the management of severe asthma, particularly in patients with type 2 inflammation who remain uncontrolled despite high-dose inhaled corticosteroids and additional controllers. While they have demonstrated substantial clinical benefits, it is important to be aware of their potential adverse effects, which may vary depending on the specific agent used. **Table 1** provides an overview of the commonly used biologicals in asthma and their associated adverse effects.

TABLE 1: Adverse effects of biologicals.

Biologicals	*Adverse effects*
Omalizumab	*Injection:* Site reactions Serum sickness-like reaction, thrombocytopenia anaphylaxis—rare
Mepolizumab	Headache, abdomen and back pain, fever, increased infection risk, and nasal congestion *Injection:* Site reactions
Dupilumab	*Injection:* Site reactions, arthralgia, increased upper respiratory tract infection (URTI) risk Transient blood eosinophilia (4–13% patients)
Tezepelumab	*Injection:* Site reactions, arthralgia, headache, and increased URTI risk Anaphylaxis—rare

OTHER KEY ASPECTS OF LONG-TERM ASTHMA MANAGEMENT

Optimal long-term asthma control extends beyond pharmacotherapy. It includes addressing modifiable risk factors and managing comorbid conditions that contribute to poor symptom control, increased exacerbation risk, and reduced quality of life.

Management of Comorbidities

- *Obesity:* Obesity is a systemic pro-inflammatory state that can worsen asthma symptoms and reduce treatment responsiveness. Individualized strategies involving nutritional counseling, increased physical activity, and behavioral support should be implemented to achieve and maintain healthy weight in children and adolescents with asthma.
- *Food allergy:* In children with coexisting food allergies, identifying and avoiding trigger foods are essential to prevent systemic allergic reactions and to improve overall asthma control. Coordination with allergy specialists and dieticians is often beneficial.
- *Allergic rhinitis:* Effective treatment of allergic rhinitis is critical, as upper and lower airways form a unified respiratory tract. Inflammation in the nasal mucosa can exacerbate asthma symptoms. Intranasal corticosteroids, antihistamines, and allergen avoidance are recommended to achieve good control, which in turn contributes to better asthma outcomes.

ADDRESSING MODIFIABLE RISK FACTORS

- *Tobacco smoke exposure:* Active smoking significantly impairs asthma control and increases the risk of severe exacerbations. Adolescents and adults should be supported through smoking cessation programs. Children must be protected from second-hand and third-hand smoke exposure, both of which are strongly linked to increased asthma symptoms and medication use.
- *Air pollution:* Exposure to both outdoor and indoor air pollutants can exacerbate asthma and reduce the effectiveness of treatment.
  - *Outdoor air pollution:* During periods of high air pollution (e.g., elevated Air Quality Index), children with asthma should be advised to remain indoors. Use of well-fitted masks while commuting or in polluted environments may help reduce inhalation of particulate matter. Families should avoid travel through highly polluted areas, especially during respiratory infections.
  - *Indoor air pollution:* Indoor pollutants such as incense sticks, mosquito coils, biomass fuels, scented candles, and air fresheners can worsen asthma symptoms. Families should be counseled to minimize or eliminate exposure to these irritants. The use of clean cooking alternatives and improving household ventilation is strongly recommended.
- *Allergen exposure:* For children with confirmed sensitization to indoor allergens (e.g., dust mites, pet dander, molds), targeted environmental control measures can help improve symptom control. While complete allergen avoidance is often impractical, specific interventions—such as controlling household dampness to prevent mold growth—can be beneficial.
- *Medication-related exacerbations:* Certain medications, notably non-selective beta-blockers and nonsteroidal anti-inflammatory drugs (NSAIDs) (especially aspirin), can trigger asthma exacerbations in susceptible individuals. In children with a history of medication-induced asthma worsening (e.g., aspirin-exacerbated respiratory disease),

these drugs should be avoided, and alternative therapies should be used under medical supervision.

CHALLENGES IN THE DIAGNOSIS AND MANAGEMENT OF PEDIATRIC ASTHMA IN INDIA

The management of pediatric asthma in India presents unique challenges that stem from a combination of clinical, socio-cultural, and systemic factors. One of the most pressing issues is the under-recognition and underreporting of asthma in children, which significantly impairs timely diagnosis and intervention. This is often due to low public awareness, both among caregivers and healthcare workers, about the varied clinical presentations of asthma, especially in younger children. Symptoms such as recurrent cough or wheeze are frequently attributed to common viral illnesses or allergic bronchitis, delaying appropriate management. Stigma and misconceptions surrounding the diagnosis of asthma further exacerbate this problem. Families may resist accepting the label of "asthma" due to fear of social judgment, long-term medication dependence, or concerns about the impact on the child's lifestyle and future prospects. This leads to underreporting, inadequate treatment adherence, and reluctance to use inhaled corticosteroids, which are the cornerstone of asthma control. Environmental factors significantly contribute to poor asthma control. High levels of ambient air pollution, particularly in urban areas, and indoor exposure to biomass fuel smoke, especially in rural and peri-urban households, are well-established triggers for airway inflammation and exacerbations. In many low-income settings, households rely on wood, cow dung, or charcoal for cooking, often in poorly ventilated spaces. Children, especially those <5 years of age, are particularly vulnerable to these exposures. Furthermore, frequent respiratory infections, common in crowded living conditions with poor sanitation, often mimic or exacerbate asthma symptoms, complicating both diagnosis and management.

The healthcare infrastructure poses additional barriers to optimal asthma care. Limited access to trained personnel, lack of diagnostic tools such as spirometry and peak flow meters at the primary care level, and inconsistent availability of essential medications hinder standardized care delivery. Many primary care physicians rely on symptomatic diagnosis without objective assessment, leading to both under- and overdiagnosis.

Moreover, cultural beliefs and traditional practices often conflict with evidence-based asthma management. Parents may prioritize herbal remedies or homeopathic treatments, delay seeking allopathic care, or discontinue inhaled therapies prematurely, believing them to be habit-forming or harmful. Economic disparities also affect access to care—while inhalers are the most effective mode of drug delivery, the perceived and actual cost of inhaled medications may deter families from initiating or maintaining long-term controller therapy. Another complicating factor is the symptomatic overlap between asthma and other common respiratory conditions such as pulmonary tuberculosis, recurrent bronchitis, and lower respiratory tract infections, especially in younger children. In regions with a high burden of tuberculosis, chronic cough or wheeze may prompt anti-TB treatment without adequate evaluation for asthma, leading to misdiagnosis, unnecessary therapy, and prolonged morbidity.

The management of pediatric asthma is undergoing a significant transformation, guided by a deeper understanding of disease mechanisms, age-specific needs, and the availability of newer therapies. Global frameworks such as the GINA

guidelines offer valuable, adaptable strategies for clinicians across diverse healthcare settings. Despite these advances, real-world challenges—such as delayed diagnosis, suboptimal adherence, and disparities in access to specialized care—continue to affect outcomes in children. The advent of biologic therapies marks a pivotal step in treating severe, uncontrolled asthma, emphasizing the importance of identifying eligible patients through clinical and biomarker-based assessment. Ultimately, tailoring guideline recommendations to individual needs and local contexts remains essential for delivering effective, long-term asthma control in pediatric populations.

SUMMARY

This comprehensive chapter reviews the evidence-based approach to asthma management in children, guided primarily by the Global Initiative for Asthma (GINA) 2025 guidelines. It outlines a structured framework that includes accurate diagnosis, severity classification, stepwise pharmacotherapy, and ongoing monitoring. Key treatment strategies include anti-inflammatory reliever (AIR) therapy, maintenance and reliever therapy (MART), and biologic therapies for severe asthma. The chapter discusses age-specific protocols—from preschoolers to adolescents—and emphasizes the importance of controller medications (e.g., inhaled corticosteroids) over traditional reliever-only strategies. It highlights the challenges of asthma diagnosis and management in India, including environmental triggers, poor access to diagnostics, treatment hesitancy, stigma, and the growing relevance of biologics such as omalizumab, mepolizumab, dupilumab, and tezepelumab. Emphasis is also placed on addressing comorbidities, environmental control, and adherence counseling for holistic asthma care in Indian children.

Key Learning Points

- *Global Initiative for Asthma 2025 provides age-specific, flexible treatment tracks*—with ICS-formoterol preferred even for mild asthma in older children and adolescents to reduce exacerbation risk and improve outcomes.
- *Stepwise pharmacotherapy* remains central to asthma management, with treatment intensification or de-escalation based on regular assessment of symptom control, adherence, and inhaler technique.
- *Biologic agents* (e.g., omalizumab, mepolizumab, dupilumab, tezepelumab) are now viable options for children with severe, refractory asthma, guided by phenotype and biomarker evaluation.
- *Inhaled corticosteroids* are the cornerstone of long-term control across all age groups, with newer strategies (MART and AIR) optimizing their use to reduce SABA over-reliance and airway remodeling.
- *Indian-specific barriers* such as poor awareness, diagnostic delays, pollution exposure, and treatment stigma must be addressed through caregiver education, system strengthening, and policy support.

SUGGESTED READING

1. Aggarwal AN, Gupta D, Jindal SK. Prevalence of bronchial asthma in Indian children: Indian Study on Epidemiology of Asthma, Respiratory Symptoms and Chronic Bronchitis in Adults (INSEARCH). Indian J Pediatr. 2009;76(3):241-6.
2. Asher MI, Montefort S, Björkstén B, Lai CK, Strachan DP, Weiland SK, et al. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. Lancet. 2006;368(9537):733-43.
3. Bush A, Saglani S, Fleming L. Severe asthma: looking beyond the amount of medication. Lancet Respir Med. 2017;5:844-6.
4. Cook J, Beresford F, Fainardi V, Hall P, Housley G, Jamalzadeh A, et al. Managing the paediatric patient with refractory asthma: a multidisciplinary approach. J Asthma Allergy. 2017;10:123-30.

5. Global Initiative for Asthma (GINA) (2025). Global Strategy for Asthma Management and Prevention– 2025 Update. [Internet]. Fontana, WI: GINA. [online] Available from https://ginasthma.org [Last accessed August 2025].
6. Kabra SK, Lodha R. Pediatric asthma in India: prevalence, management and gaps in implementation. J Postgrad Med Educ Res. 2020; 54(1):9-15.
7. Lodha R, Kabra SK. Management of asthma in children in India: current perspectives. Indian J Pediatr. 2018;85(12):1040-7.
8. Martinez FD. Genes, environments, development and asthma: a reappraisal. Eur Respir J. 2007;29(1): 179-84.
9. Worldwide variations in the prevalence of asthma symptoms: the International Study of Asthma and Allergies in Childhood (ISAAC). Eur Respir J. 1998;12(2):315-35.

Allergopedia

Clinical Protocols in Pediatric Allergy

Equipping the Next Gen in Allergy Care

Empowering Clinicians with Practical, India-specific Protocols for World-class Pediatric Allergy Care

Allergic diseases in children are on the rise, yet effective, standardized guidance tailored to India's unique clinical realities remains scarce. *Allergopedia: Clinical Protocols in Pediatric Allergy* bridges this gap—offering evidence-based, step-by-step protocols that are practical, accessible, and relevant across diverse healthcare settings.

Compiled by two of India's leading pediatric allergists, this book blends global scientific advances with local expertise, addressing diagnosis, management, prevention, and environmental control. Packed with clinical insights, real-world tips, and region-specific strategies, *Allergopedia* is designed to be your trusted companion in delivering optimal allergy care to every child, every time.

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Together, they share a vision to make high-quality, evidence-based pediatric allergy care practical, accessible, and relevant for clinicians across the country.

Shelving Recommendation
PEDIATRICS

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