

Children Allergies in Saudi Arabia: The Situation and Challenges—Narrative Review

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Abstract: Pediatric allergic diseases like asthma, allergic rhinitis, eczema, and food allergies are highly prevalent in Saudi Arabia. This narrative review synthesizes diverse evidence on the prevalence, clinical presentation, and management of pediatric allergic diseases in Saudi Arabia, highlighting gaps in knowledge and practice to inform future healthcare strategies. Studies report allergy rates between 13-45% among Saudi children. Common medications used include antihistamines, nasal steroids, bronchodilators, and topical creams. While specific immunotherapy is growing in popularity for persistent IgE-mediated conditions. This paper reviews recent literature on the burden, management strategies, treatment options, and challenges regarding pediatric allergies in Saudi Arabia. Key challenges include a lack of awareness among families and even healthcare professionals, a shortage of pediatric allergy specialists, limited accessibility, high treatment costs, and a lack of standardized protocols. However, advancements in immunotherapy and oral food desensitization provide promising prospects. More research, public health initiatives, specialized workforce capacity building, improving affordability, and national guidelines will help address this major pediatric concern in the kingdom.

Keywords: Pediatric, allergy, antihistamines, Saudi Arabia.

INTRODUCTION

The burden of pediatric allergic diseases and asthma, particularly as these conditions begin in childhood and persist into adulthood, is becoming increasingly important. The use of specific immunotherapy, either subcutaneously (SCIT) or sublingually (SLIT), has been demonstrated to be effective for patients with confirmed IgE-mediated airway diseases; however, it is not recommended for food allergies or atopic eczema. Early childhood food allergies and eczema increase the risk of asthma and respiratory allergies in adulthood. Currently, allergic disease management includes oral/intranasal histamine H1-receptor antagonists (antihistamines), oral/inhaled corticosteroids, leukotriene modulators, local chromones, and B2-adrenoceptor agonists [1].

Asthma prevalence among pediatric patients in Saudi Arabia has dramatically increased over the past

three decades, ranging from 8% to 25%. Recurrences of acute episodes of breathing difficulty require prompt treatment, usually involving the use of systemic corticosteroids. Asthma exacerbations continue to occur, although current therapeutic regimens alleviate symptoms effectively. A combination of long-acting beta2 agonists (LABAs) and inhaled corticosteroids (ICS) was considered to prevent asthma exacerbations. It has been shown that this combination therapy reduces the risk of serious asthma-related events, such as hospitalizations and deaths [2]. There are several phenotypes and endotypes of asthma that can be triggered by infections, allergies, or physical activity. It is common for patients to experience coughing, wheezing, respiratory difficulties, and obstructions of the airways, regardless of the cause of their episodes. In a study conducted to assess asthma awareness among family physicians, nebulized bronchodilators were the most common therapeutic approach [3].

Similarly, allergic rhinitis (AR) is a common allergic disease that adversely affects quality of life and is associated with significant health care and social costs.

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Persistent, moderate, or severe AR is associated with several comorbidities. ICS and antihistamines are the most commonly prescribed treatments for AR [4]. A study found that the most common AR treatment was oral antihistamines (76%), followed by nasal corticosteroids (49%) and a combination of both [2]. For the treatment of AR symptoms in children, antihistamines have been proven to be the most safe and effective option [5].

A food allergy is an adverse immunological reaction that occurs when repeatedly exposed to the same food [6]. A common finding is that asthma and food allergy often coexist, especially since both conditions share a number of common risk factors [7]. It has been demonstrated that children with food allergies experience asthma at a higher rate and at an earlier age than children without food allergies [8]. Similarly, Children who suffer from sensitivities to common foods and aeroallergens have a greater risk of developing respiratory allergic diseases than those who do not [9].

Despite the growing burden of pediatric allergic diseases and asthma in Saudi Arabia, significant challenges remain, including a lack of awareness among families and healthcare providers, limited accessibility to specialized care, high treatment costs, and the absence of standardized protocols. This review consolidates the current knowledge on the prevalence, clinical presentation, and management of these conditions, highlighting the pressing need for targeted interventions. By synthesizing evidence and outlining practical challenges, this review aims to inform public health initiatives, guide healthcare policies, and support the development of tailored management strategies to improve outcomes for children with allergic diseases in Saudi Arabia.

METHODS

This review adopted a narrative design to synthesize and evaluate the existing literature on pediatric allergic diseases and asthma in Saudi Arabia. A comprehensive search of peer-reviewed articles, clinical studies, and relevant guidelines was conducted using major databases such as PubMed and Web of Science. The search focused on studies published in English that address the prevalence, risk factors, clinical presentation, and management of pediatric allergic conditions in Saudi Arabia. Key themes were identified and summarized, with a focus on highlighting gaps in current knowledge and clinical practice. Unlike systematic reviews, which employ strict inclusion and

exclusion criteria and quantitative synthesis, this narrative review provides a qualitative summary to capture the breadth of available evidence and present actionable insights for improving care.

Prevalence of Allergies in Saudi Arabia

The prevalence of allergies in Saudi Arabia cannot be underestimated. Numerous studies reported high prevalences of allergies among Saudis. Sobki and Zakzouk conducted an epidemiological survey using a modified "International Study of Asthma and Allergies in Childhood" (ISAAC) questionnaire for the rhinitis phase 1 [10]. During the past year, they surveyed 10,000 children for clinical history of rhinitis (e.g., sneezing, rhinorrhea, irritation, nasal blockage). Among 9,540 children with complete data, 2,529 (26.51%) children were reported to have rhinitis, and 25.66% of them had a clinical diagnosis of asthma. Prevalences of allergic conditions reported in the literature varied depending on the condition itself and the region of Saudi Arabia. A study reported an AR prevalence of 45% in Makkah [11], 13.5% in the Qassim region [12], and 5% in the health colleges of Najran University [13]. These variations may be explained by variations in the sample size and population characteristics of these studies, or they may represent inherent differences in allergy risk factors among regions in Saudi Arabia. In any case, allergic conditions constitute a problem that cannot be ignored among the Saudi population (Table 1).

Allergic Disorders Among Saudi Children

The frequency of allergy illnesses among children in Saudi Arabia is quite high, according to several studies published in the country. Nahhas *et al.* conducted a parental-filled cross-sectional survey of schoolchildren in Madinah based on the ISAAC tool [14]. Among 5,188 respondents, 10.3% were reported to have eczema, 24.2% rhinitis, and 23.6% asthma. At least 41.7% of all children were reported to have symptoms suggestive of one allergic disorder. These prevalences were comparable across the Arabian Peninsula. For instance, Herz conducted a systematic review of the prevalence of atopic disease in children on the Arabian Peninsula [15]. In countries located on the Arabian Peninsula, the overall rates of atopic diseases that have been recorded are comparable to those reported in other developed nations. The high standard of living and lifestyle in the region is likely a direct result of the region's thriving economy, which is reflected in such factors. Additionally, the increased frequency of atopic

Table 1: Summary of Five Recent Studies Investigating the Prevalence of Allergy in Saudi Arabia

Author	Study Design	Population	Sample Size	Summary of results
Alharthi 2023	Online survey cross-sectional study	Makkah city	466	45% of participants had AR. A blocked nose was the most prevalent symptom (79.6%), followed by sneezing (74.2%) and rhinorrhea (71.5%). Furthermore, the prevalence of rhino-conjunctivitis in this study was 56%.
Almatroudi 2021	Online survey cross-sectional study	The Qassim region	850	28.8% of participants self-reported as having any respiratory allergy 58.1% of families had at least one member with a respiratory allergy Prevalence of AR and asthma were 13.5% and 11.2%, respectively.
Alzaidi 2020	Online survey cross-sectional study	Al-Baha	1,184	History of AR was present in 32% of males and 38.6% of females. The most commonly reported allergens included dust mites (71.7%) and mold (15.9%).
Alqahtani 2020	Cross-sectional study through an interview	Health Colleges of Najran University	222	The prevalence of physician-diagnosed allergy conditions was as follows: atopic dermatitis (13.1%), bronchial asthma (27%), and allergic rhinitis (5%).

disorders in the region may be partly attributable to genetic factors, such as those associated with gene polymorphism, as well as the high rate of consanguinity that exists in the area. The association between high economic status and the prevalence of allergic diseases in children has been described before. Chamara, Wronka, and Muc aimed to determine the correlation between socioeconomic status, lifestyle, and the prevalence of allergic diseases in children in their paper [16]. A further investigation was conducted to determine whether there were any changes in the rate of biological development between the children who suffered from allergies and their peers. Cross-sectional research was conducted on 301 children between the ages of 4 and 9. Fifty-eight children were discovered to have allergies, according to the declarations made by their parents (19.3 %). In comparison to the towns, the percentage of children who were allergic to allergens was much lower in the villages (12.8 % vs. 26.2 %). In addition, the higher incidence of allergic reactions in children was found to be associated with factors such as the level of education of their parents, the economic conditions of their families, the use of artificial feeding during the first few months of their lives, and the presence of nurseries. However, the children who were identified with allergies had a higher body weight than their peers, but they did not differ in height from their peers.

Clinical Presentation

In children, allergies can manifest itself in a variety of ways, and the clinical manifestation of the allergy is

determined by the kind of allergy. Hives, swelling, itching, and anaphylaxis are some of the symptoms that can be caused by IgE-mediated allergies. On the other hand, non-IgE-mediated allergies can induce symptoms such as vomiting, diarrhea, and failure to thrive [17,18]. An allergic condition known as atopic dermatitis is quite prevalent among children and newborns, and the frequency of this condition looks to be on the rise [19]. Atopic dermatitis is characterized by its clinical manifestations, which include itching, erythema, and scalp scaling. Food protein-induced enterocolitis syndrome, often known as FPIES, is a kind of food allergy that is not mediated by IgE and is characterized by severe acute gastrointestinal symptoms and lethargy. This condition primarily affects newborns and young children [20]. Allergic reactions to cow's milk, eggs, peanuts, tree nuts, soy, wheat, fish, and shellfish are the most prevalent types of dietary allergens that affect children [21]. Another form of food allergy that can produce symptoms in children is an allergy to food additives. These include artificial food coloring and flavorings, among other artificial ingredients. These additives are not allergens in and of themselves, but they have the potential to cause allergic reactions in those who are sensitive to them [22]. Food additive allergies can manifest itself in a variety of ways, including symptoms of food allergies and signs of atopic dermatitis. Food additive allergies can manifest themselves clinically in a variety of ways, and the intensity of the reaction can range from moderate to severe, depending on the individual [23]. Avoiding allergens, using antihistamines, and, in certain instances, undergoing desensitization or

employing leukotriene receptor antagonists are all components of the treatment for food allergies in children. Moisturizers, light topical corticosteroids, and antihistamines are all effective treatments for atopic dermatitis. Introducing common allergens to children at an early age, breastfeeding exclusively, and practicing proper cleanliness are all important components in the prevention of food allergies in children. It is essential to identify and treat food allergies in children at an early age to minimize the risk of severe responses and to ensure the children's overall health [17-20,24].

Burden of Allergies in Children

Children's allergies can place a substantial strain not only on their own health-related quality of life but also on the quality of life of their families and the people who care for them. For instance, peanut allergy affects around 2% of the general population in Western nations, and the incidence of this allergy may grow [25]. Patients who are allergic to peanuts, as well as their relatives and caregivers, have a significant responsibility to self-manage to prevent inadvertent exposure to peanuts and to self-administer emergency treatment if it is required. An allergy to peanuts is associated with increased risks of accidental exposure, severe responses, and possibly deadly anaphylaxis when compared to other types of food allergies [25,26]. As a result of being bullied, children who have a peanut allergy frequently experience feelings of despair, shame, and worry. Patients who suffer from peanut allergies and their families or caregivers experience a severely diminished quality of life in terms of their health because of the cumulative effects of these variables [26]. Allergic rhinitis is another prevalent allergy that affects roughly 60 million adults and children in the United States. It significantly burdens patients' quality of life, sleep, job productivity, and activity levels [27]. Adolescents who were conceived using assisted reproductive technologies (ART) may be at a greater risk of developing allergies, including allergic rhino-conjunctivitis, food allergies, and positive skin-prick tests, in comparison to their counterparts who were conceived without the use of ART [28].

Diagnosis and Clinical Approach

The diagnosis and clinical approach of allergies in children involves a comprehensive assessment of clinical symptoms, immunological markers, and specific diagnostic tests. A study found that 10.9% of parents reported having a child with a food allergy, with two-thirds of these cases detected by the pediatrician [29]. The study highlighted the need to improve awareness

and adherence to guidelines among pediatricians. Another study on the optimization of food allergy diagnostics in children with gastroduodenal pathology and atopic dermatitis found that a comprehensive clinical and immunological examination is essential for identifying specific clinical criteria and immunological markers of food allergy [30]. The study highlighted the importance of determining the spectrum of food sensitization and conducting immunological assessments to diagnose food allergies in children. Additionally, a real-world retrospective study emphasized the efficacy of allergen immunotherapy in treating pediatric allergies, particularly respiratory allergies, and investigated the utility of combination treatment with rush immunotherapy and pretreatment anti-IgE in children [31]. Furthermore, recent advances in glycoimmunology have shown the potential of sialic acids in the treatment of food allergies, indicating the importance of understanding the role of specific components, such as sialylated polysaccharides, in modulating immune responses and their potential as a target for food allergy intervention [32].

Management Strategies and Treatment Options

To determine whether or not a child has allergies, allergists in Saudi Arabia use a variety of diagnostic approaches. Comprehensive clinical evaluations, skin prick testing to identify sensitizations, blood tests to examine IgE levels, and lung function tests to diagnose asthma are some of the tests that are included in this category. After a diagnosis, the therapy focuses on avoiding triggers, regulating symptoms, and tailoring medicine to the severity of the condition. Among the medications that are frequently utilized in Saudi Arabia are antihistamines, nasal steroids, bronchodilators, and topical creams. These medications are authorized and readily available [33,34]. In addition, immunotherapy is becoming increasingly popular as a long-term treatment option for the management of pediatric allergies that appear to be unresponsive to other treatments (Table 2). This entails administering a treatment similar to a vaccine and containing minute quantities of an allergen to gradually reduce the body's sensitivity over time. When administered to Saudi children, immunotherapy has been demonstrated to have positive results, with options including subcutaneous and sublingual approaches. The Kingdom of Saudi Arabia places a strong emphasis, in addition to therapeutic therapy, on preventative efforts to lower the prevalence of allergic diseases in children [34-36]. Some examples of these are health education efforts that aim to improve knowledge about allergens

Table 2: Summary of Guidelines for the Diagnosis and Clinical Approach in Pediatric Allergy

Aspect	Guidelines
Patient History	- Thoroughly collect and analyze the patient's medical history, focusing on symptoms, duration, and triggers. - Inquire about a family history of allergies, asthma, or other related conditions.
Physical Examination	- Perform a comprehensive physical examination, paying attention to skin, respiratory, and gastrointestinal systems.
Allergen Exposure Assessment	- Identify and evaluate potential allergen exposures in the patient's environment (e.g., pets, pollen, dust mites, food). - Consider the timing and frequency of symptoms related to exposure.
Diagnostic Testing	- Use allergy testing methods such as skin prick tests or blood tests to identify specific allergens. - Interpret test results in conjunction with clinical symptoms and history.
Food Allergies	- For suspected food allergies, conduct elimination diets or oral food challenges under medical supervision.
Asthma Evaluation	- Assess and monitor respiratory function, especially in children with suspected or diagnosed allergies.
Anaphylaxis Risk Assessment	- Evaluate the risk of anaphylaxis in individuals with known allergies. Provide appropriate education and an anaphylaxis action plan.
Management and Treatment	- Develop an individualized management plan that may include allergen avoidance, medications (antihistamines, bronchodilators), and immunotherapy. - Educate patients and their families on recognizing and managing allergic reactions.
Follow-up and Monitoring	- Schedule regular follow-up appointments to assess treatment effectiveness, adjust management plans, and address any new concerns. - Monitor growth and development in pediatric patients with allergies, especially those on long-term medications.
Collaboration with Specialists	- Collaborate with allergists, pulmonologists, and other specialists for complex cases or when further expertise is needed.
Education and Counseling	- Provide education on allergy management, including environmental control measures, use of medications, and emergency response plans.
Psychosocial Support	- Recognize and address the psychological and social impact of allergies on children and their families.
Preventive Strategies	- Implement preventive measures, such as allergen avoidance and immunization, to reduce the risk of allergic reactions. - Stay updated on current guidelines and advancements in allergy management.

and techniques of avoidance in communities and schools. It has also been adopted to improve the quality of the air inside schools by utilizing ventilation, air filters, and other similar methods. To make a long-lasting impact, however, there is a need for more public health initiatives involving multiple facets. When it comes to diagnosing and treating pediatric allergies across the kingdom, the Saudi government confronts hurdles due to the limited number of specialist healthcare providers at its disposal. In addition to this, there is a deficiency in the administration of established local protocols. Combining the encouragement of research with the elimination of these obstacles has the potential to dramatically improve the quality of life for Saudi children who suffer from allergies [34].

Antihistamines

Antihistamines are one of the most used medications for treating allergies in Saudi children [34]. They work by blocking the action of histamine, a chemical released by the immune system during an allergic reaction, to relieve symptoms like itching,

sneezing, and hives. First-generation antihistamines like diphenhydramine and chlorpheniramine are accessible but cause more sedation [37]. Newer second-generation antihistamines such as loratadine, fexofenadine, and cetirizine are now widely prescribed by Saudi physicians as they are less sedating. These non-drowsy antihistamines provide effective, temporary symptom relief for children with mild to moderate seasonal allergic rhinitis, conjunctivitis, skin reactions, and itching. They can be used either on an as-needed basis or daily for allergy prevention. The Saudi Food and Drug Authority has approved several branded and generic antihistamine formulations for pediatric use. However, antihistamines should be used under medical guidance to ensure the appropriate product, dose, and duration for the child's age and weight [34-36,38].

First-Generation Antihistamines

Antihistamines of the first generation, including chlorpheniramine (Chlor-Trimeton) and diphenhydramine (Benadryl), are antiquated drugs that have been in use for decades. In addition to dry mouth and impaired vision, they may induce sleepiness and

other adverse effects despite their efficacy in alleviating allergy symptoms. It is contraindicated to provide these drugs to children less than two years of age [39].

Second-Generation Antihistamines

Antihistamines of the second generation, including cetirizine (Zyrtec) and loratadine (Claritin), are more recent drugs with a reduced propensity to induce drowsiness and other adverse effects. They are generally deemed safe for children older than two years [39].

Mechanism of Action

Vascular permeability is raised as a result of histamine (an endogenous chemical messenger), which causes fluid to flow from capillaries into the surrounding tissues. This phenomenon results in a general enlargement and constriction of blood vessels. This causes symptoms such as itching, sneezing, and runny nose. By blocking histamine, antihistamines can relieve these symptoms. Antihistamines inhibit this phenomenon via their antagonistic activity at the H-1 receptors, resulting in a decrease in symptoms associated with allergies and similar conditions. First-generation antihistamines exhibit a distinct therapeutic and adverse effect profile due to their ability to readily traverse the blood-brain barrier and enter the central nervous system, where they antagonize H-1 receptors.

In contrast, second-generation antihistamines exhibit selectivity in their binding to peripheral histamine receptors. The pharmacological impact of first-generation antihistamines typically lasts between four and six hours. Second-generation antihistamines,

on the other hand, are effective for 12 to 24 hours. Both substances undergo hepatic metabolism via the P450 cytochrome system [39].

Considerations for Use in Children

When using antihistamines to manage allergies in children, there are several considerations to keep in mind:

Age

Several antihistamines are not advised for use in children under a certain age. This is because the safety and effectiveness of certain antihistamines have not been established in younger children. For example, diphenhydramine is not recommended for children under the age of 6 due to the risk of serious side effects [40-44].

Dosing

The child's weight, not their age, should be used to determine the appropriate dosage of antihistamines. Since children's weight may vary greatly, dosage calculations based only on age might result in either an under or overdose [41,43,44].

Side Effects

Antihistamines used in children may induce drowsiness, dry lips, and decreased vision, among other undesirable side effects (Table 3). Contrary to diphenhydramine, certain antihistamines, such as cetirizine and loratadine, have a lower propensity to induce drowsiness. Regarding allergic responses, when these antihistamines are prescribed, parents and caregivers must be knowledgeable about these

Table 3: Comparison between First- and Second-Generation Antihistamines for the Treatment of Allergies in Children

Feature	1st Generation Antihistamines	2nd Generation Antihistamines
Examples	Diphenhydramine, chlorpheniramine, clemastine	Loratadine, cetirizine, fexofenadine
Sedating?	Yes	No
Impair learning?	Yes	No
Cardiac side effects?	No	Yes, for some
Is nasal spray available?	No	Yes, azelastine
Approved age	2+ years	Varies, typically 6+ years
Dosing frequency	Every 4-6 hours	Once or twice daily
OTC available?	Yes	No
Main advantages	Inexpensive, fast-acting	Non-sedating, longer acting, no cognitive impairment
Main disadvantages	Sedation, cognitive impairment, frequent dosing	Expensive, prescription required

potential side effects and ensure that their child does not have any bad reactions by closely monitoring their child [40,42-44].

First-generation antihistamines, such as diphenhydramine, can cause cardiac side effects, including arrhythmias and QT prolongation, which may pose a risk, especially in children with underlying cardiac conditions. On the other hand, second-generation antihistamines, such as cetirizine and loratadine, are less likely to cause cardiac side effects, making them a safer choice in this regard [43].

AR can impede learning during the school-age years, and both uncontrolled symptoms of AR and adverse effects from medications, such as sedating first-generation antihistamines, can diminish cognitive function and learning. Treatment with a non-sedating second-generation antihistamine has been shown to improve learning potential and is an ideal choice for treatment in children with allergic rhinitis [45].

Interactions

Antihistamines may interact negatively with additional medications, including those delivered without a prescription as well as those that are. This phenomenon may be shown through the interaction between alcohol and sedatives, tranquilizers, or antihistamines, which may raise the risk of sleepiness and other undesirable effects. Physicians must be aware of any additional prescriptions the child is already taking. This is to prevent any potential drug interactions that might impair the safety and effectiveness of the medications [40-44].

Challenges In the Management of Allergies among Saudi Children

Lack of Awareness and Education

Even among some Saudi Arabian medical professionals, there is a lack of knowledge about allergies, including their causes, symptoms, and the right treatment for them. As a result of this information gap, there is sometimes a delay in diagnosis, and improper therapies are administered, which ultimately results in inadequate control of allergy diseases in children. When it comes to addressing this issue, targeted educational programs are necessary.

Shortage of Specialized Healthcare Providers

Saudi Arabia lacks an adequate number of trained specialists in allergy and immunology for children, especially considering the high burden of these

diseases. The dearth of pediatric allergists poses barriers to timely diagnosis, access to expert management, and advanced therapies. Building specialized workforce capacity is essential.

Accessibility Barriers to Healthcare Facilities

Due to the considerable distances involved and the limited availability of such facilities outside of large cities, many Saudi youngsters have difficulty reaching healthcare clinics equipped to treat allergies. This can be partially overcome with the assistance of telemedicine. Despite this, it is still difficult to guarantee that standardized allergy services are available under pediatric care in all places.

High Cost of Treatment

The management of pediatric allergies over an extended period frequently necessitates the use of costly controller and rescue drugs. In Saudi Arabia, families with lesser incomes may find it difficult to buy chronic therapy such as inhalers and anti-inflammatory medications on a financial level. The provisions that are currently in place to improve the affordability of important allergy medications for children are insufficient.

Lack of Standardized Protocols

When it comes to the management of pediatric allergies, differences in health services can arise as a result of variations in diagnostic criteria, treatment guidelines, and follow-up protocols. At this moment, it is imperative that accredited national standards and staff training be developed in order to enhance and simplify the process of providing allergy care to children [34,36,37,46].

Opportunities and Future Perspectives

The future perspective of allergy treatment in children, including those in Saudi Arabia, is promising, with ongoing developments in immunotherapy and other treatment modalities. Recent updates have shown that allergen immunotherapy (AIT) has been proven to significantly improve symptoms and quality of life in children with allergic illnesses, reduce medication use, and stop the development of new allergen sensitization. Additionally, oral immunotherapy is being investigated as a promising treatment option for children with persistent IgE-mediated food allergy. Furthermore, there is ongoing research on sublingual immunotherapy for infants at high risk of developing allergies, showing potential in preventing allergic asthma later in childhood [47-49].

The treatment of IgE-mediated allergies can be accomplished by the use of AIT, which involves the recurrent delivery of allergen components. The traditional method involves administering subcutaneous injections over three years. This method has the potential to create long-term antigen-specific tolerance that continues even after therapy is discontinued. In recent years, sublingual immunotherapy has emerged as a viable and risk-free supplement. A decrease in allergen-specific T helper 2 cells, an increase in regulatory T and B cells, and an increase in allergen-specific IgG and IgA antibodies that block IgE receptors are the main mechanisms by which these treatments are effective. The measures now being used aim to enhance safety, convenience, and effectiveness. The use of recombinant hypoallergenic allergen variants, combinations with immune modifiers or allergen-specific antibodies, and alternate administration routes such as intra-lymphatic or epi-cutaneous administration are some examples of these measures. Personalized regimens that are customized to molecular diagnostics and innovative combinations that produce enduring tolerance more quickly are the routes that life will take in the future. The application of the inhalant allergen immunotherapy findings to the treatment of food allergies continues to present significant obstacles. There is a high incidence of adverse effects associated with oral immunotherapy for peanut allergy, and it has been demonstrated that it is difficult to build lasting

tolerance following discontinuation of the treatment. Both earlier intervention in young children and combination techniques are being investigated as potential strategies for finding a solution. Significant advancements have been made in this sector, but there are still obstacles to overcome in order to achieve immunotherapy for food allergies that is safe, effective, and long-lasting [49].

In the context of Saudi Arabia, where there is a substantial concern with food allergies among children, the future outlook of allergy treatment will likely involve the establishment of more effective diagnosis and treatment strategies, as well as the implementation of health education programs to increase awareness and support the management of food allergies. Addressing the challenges in healthcare providers' perception and practice toward anaphylaxis in children in Saudi Arabia is also crucial for improving the future management of allergies in children [50,51]. Increasing Saudi research productivity in allergy-related conditions is also a great opportunity to look for. There has been a steady annual growth rate in the number of research publications about allergic conditions in Saudi Arabia (Figure 1).

RECOMMENDATIONS

Pediatric allergic diseases are highly prevalent in Saudi Arabia, affecting an estimated 13-45% of

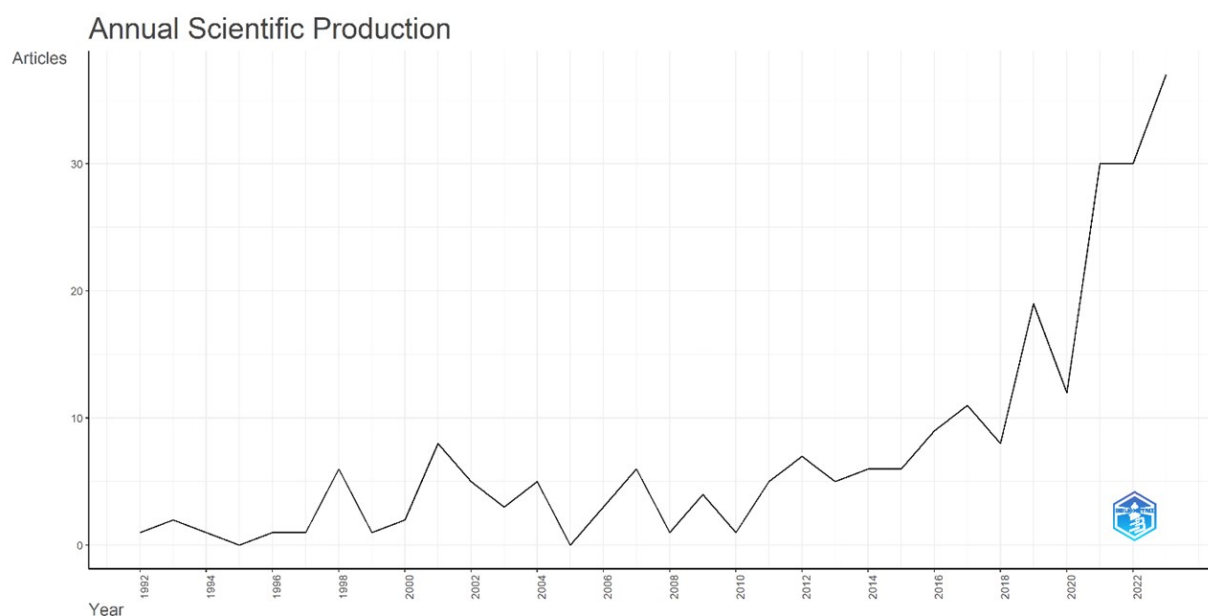


Figure 1: Annual Scientific Production of Allergic-condition-related research in Saudi Arabia. Figure created using biblioshiny app of bibliometrix package in R using a Pubmed searching API: "(Allerg*[title/abstract] OR Asthm*[title/abstract]) AND preval*[title/abstract] AND Saud*[title/abstract]".

children. With rising rates and a shortage of allergy specialists, it is imperative for physicians to enhance their own understanding and evidence-based practices in allergy care. Practical clinical training programs should be implemented for primary care doctors and pediatricians to diagnose and manage childhood asthma, allergic rhinitis, eczema, and food allergies. Treatment guidelines should emphasize controller medications for persistent cases, along with counseling families on trigger avoidance and anaphylaxis preparedness. Referral pathways to specialized centers need to be streamlined [52-54].

Further high-quality research by Saudi academia can uncover unique genetic, environmental, and lifestyle risk factors for allergies in the local population. This can pave the way for optimized prevention strategies and immunotherapy innovations tailored to regional needs. Health authorities should prioritize expanding workforce capacity by increasing allergy subspecialty seats while also developing national protocols aligned with international best practices. Access and affordability of lifesaving epinephrine auto-injectors and chronic medications for vulnerable children must be ensured through coverage policies and targeted funding programs. A multifaceted cooperative effort is imperative to curb the public health impacts of pediatric allergies in the kingdom.

LIMITATIONS

While this review provides valuable insights into the prevalence, clinical presentation, and management of pediatric allergic diseases in Saudi Arabia, it is not without limitations. As a narrative review, it lacks the systematic methodology and quantitative synthesis of a systematic review, which may introduce bias in study selection and interpretation. The reliance on secondary data from published studies limits the ability to assess unpublished or ongoing research, potentially excluding relevant findings. Additionally, variations in study design, sample size, and methodology across the included literature may affect the generalizability of conclusions. Finally, the focus on Saudi Arabia may limit the applicability of the findings to other regions with different healthcare systems, genetic profiles, and environmental factors. These limitations highlight the need for future systematic reviews and primary research to address these gaps and validate the findings.

CONCLUSION

In conclusion, pediatric allergic diseases and asthma pose a significant health burden among

children in Saudi Arabia, with prevalence rates comparable to or exceeding global averages. This review highlights key challenges, including limited awareness, accessibility barriers, high treatment costs, and a lack of standardized protocols impeding effective management. These findings underscore the need to integrate local strategies into global child health and nutrition frameworks, such as the World Health Organization's (WHO) Global Strategy for Women's, Children's, and Adolescents' Health, which emphasizes equitable access to care and the prevention of chronic conditions. Aligning with these global initiatives can guide targeted interventions, foster international collaborations, and improve health outcomes for children affected by allergies and asthma, both regionally and worldwide.

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DATA AVAILABILITY

All data are presented in the manuscript text and tables

AUTHOR CONTRIBUTION

HIA contributed to conceptualizing. NFT, ASA, and RHM contributed to the literature search. YYM, HIA, and ASA contributed to writing the original draft. RHM and NFT contributed to editing the manuscript.

All the authors have read and approved the manuscript. The requirements for authorship have been met, and each author believes that the manuscript represents honest work.

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