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Comprehensive Review Of Allergic Rhinitis Diagnosis: From Clinical History To Analysis

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Abstract: Allergic rhinitis (AR) is a prevalent condition characterized by inflammation of the nasal mucosa due to allergic triggers, causing significant morbidity and impairment of quality of life. Accurate diagnosis is essential for effective management and treatment, but remains challenging due to the overlap of symptoms with other nasal disorders. This comprehensive review explores the diagnostic approach to allergic rhinitis, from patient history to advanced diagnostic testing. We begin by discussing the critical role of a thorough clinical history, including symptom onset, seasonal patterns, and potential allergen exposure, in differentiating AR from other causes of rhinitis. Physical examination findings, particularly the identification of allergic nasal mucosal changes, are also examined. The review then delves into diagnostic testing modalities, including skin prick tests (SPT), specific IgE blood tests, and emerging methods like nasal allergen provocation tests. By synthesizing current evidence, this review aims to provide a clear, updated framework for diagnosing allergic rhinitis, ensuring early and precise identification of the condition for optimal patient care.

Index Terms **- Allergic rhinitis, allergens, pruritis, nasal congestion, rhinorrhea, rhino conjunctivitis, IgE.**

I. INTRODUCTION

Allergic rhinitis (AR) is an atopic complaint it's characterized by signs and symptoms of nasal traffic, clear rhinorrhea, sneezing, postnasal drip, and nasal pruritis. Symptoms of AR intrude with all angles of diurnal life and are associated with reduced quality of sleep and work performance. Rhinitis is also defined as inflammation of the nasal mucosa and it affects up to nearly 40 of the population. It affects one in six individuals and it's also associated with significant morbidity, loss of productivity and healthcare costs. Historically, allergic rhinitis was allowed to be a complaint of the nasal airway only. Still, the development of the unified airway thesis has classified allergic rhinitis as an element of systemic allergic response, with other conditions that are associated with it, like asthma and eczema, they also partake an underpinning special pathology. Among all of the causes of mucosal inflammation, allergic rhinitis is the most common cause of mucosal inflammation, it goods 1 in 6 of the individualities. (1,2) Allergic rhinitis is a part of allergic diseases that can profoundly affect the well-being and quality of life of people suffering from it.

Its opinion and operation bear a coordinated approach by a specialist in unlike immunology or rhinology rather than a fractured or organ grounded approach. (3) The common and contemporaneously being diseases associated with allergic rhinitis are asthma and conjunctivitis. (4) Accurate opinion and effective operation are veritably important to reduce symptoms, help complications, and ameliorate case well- being. Though there are advancements in understanding pathophysiology of allergic rhinitis, its opinion still remains grueling due to its lapping symptoms with other conditions associated with respiratory system, complex symptomatology and limitations in its testing. A holistic approach in precisely assaying case's clinical profile, physical assessment, perceptivity webbing and molecular study is pivotal for scrupulous evaluation and customized remedy (5).

Aim of this review is to deliver a brief and to date review of the individual surveillance geography in allergic rhinitis, interpreting rearmost improvements and specialist considerations to communicate exemplary approaches in clinical appraisal, individual analysis, and molecular testing. By evaluation of the complications of opinion of allergic rhinitis, this review searches to boost understanding of a medical professional, enhanced health services and show areas for forthcoming advancements.

II. Classification of Allergic Rhinitis

A. Based on frequency of symptoms: [6, 8, 9]

1. Intermittent Allergic Rhinitis:
   Symptoms are present: for less than four days a week / for less than four consecutive weeks.
2. Persistent Allergic Rhinitis:
   Symptoms are present: for more than four days a week and for more than four consecutive weeks.

B. Based on severity allergic rhinitis is classified into:

1. Mild Allergic Rhinitis:
   Symptoms might be present but not be troublesome
   None of the following symptoms are observed:
   Sleep disturbance
   Impairment of daily activities or work schedule
2. Moderate or Severe Allergic Rhinitis:
   More than one symptom may be present:
   Sleep impairment and impairment of daily activities and word schedule
   Troublesome symptoms

C. Based on type of allergens/ time of exposure

1. Seasonal
2. Perennial
3. Occupational

1. Seasonal Allergic Rhinitis:
   This type of allergic rhinitis is usually caused by outdoor allergens or environmental changes like pollens grasses, weeds, mold spores, temperature or humidity changes.
2. Perennial Allergic Rhinitis:
   This type of allergic rhinitis is commonly caused due to dust mites, pet dander, cockroach allergens or indoor air pollutions; all these are indoor allergens.
3. Occupational Allergic Rhinitis
   This type of allergic rhinitis is caused due to airborne particles at work place like chemicals, dust, insecticides, metals, biocides, enzymes, proteins, etc, which lead to nasal and eye symptoms. Occupations that are at high risk for such kind of allergic rhinitis are laboratory technicians, bakery workers, farmers, construction workers, woodworkers, veterinarians, manufacturing workers, agricultural workers and florists, etc.

This classification cannot be considered totally convincing because: [7]

1. Some types of allergens cannot be considered specific to ant one type of allergic rhinitis.
2. Many patients are allergic to more number of allergens so they may remain affected throughout the year while others may experience symptoms at some particular time. [7, 9]
3. Some patients allergic to single type of pollens may experience perennial allergic rhinitis. [7, 10]

4. Environmental conditions cause changes in the duration of pollen or mould formation due to which prediction could be difficult. [7]
5. Sensitivity and tolerance to allergy may vary from patient to patient.
6. Some nonspecific irritants may intensify symptoms in symptomatic patients and may also cause symptoms in non-symptomatic patients. [7, 11]

III. History

History plays a very important role in diagnosis and management of allergic rhinitis. A brief description of history helps the medical professionals to identify causative allergens, analyze severity of symptoms and frame an effective treatment or therapy. While communicating about the history, patients will usually specify about the following typical signs and symptoms of allergic rhinitis: nasal congestion, clear rhinorrhea, sneezing, postnasal drip, and nasal pruritis. Allergic conjunctivitis is also often related with allergic rhinitis and its symptoms commonly include itching, tearing and redness in the eyes. [5, 1]
Enquiring and taking an in depth medical history of a patient is very important part for assessment of allergic rhinitis, a detailed and through history should include previous personal medical history, family medical history, social medical history, surgical history, medication history different types of symptoms, their time and duration, how frequently the symptoms occur, what are the suspected exposures, what factors alleviate the symptoms, seasonality of the symptoms and environmental history.

While taking patient's history, it is important to be aware that the patient might not often offer all the clues that required for diagnosis, specific questions should be asked to find out more information. For example, a patient may complain of sneezing, having a runny nose and blocked nose in the past one or two weeks, but he/she might not realize it until asked that their nose has been blocked to a less severe degree for a much longer time. [12]
Clinical histories are an essential tool in medical practice, and in case of side effects, they help to classify and stratify patients, providing personalized and accurate treatment [12, 13].
Each patient history contains important data and its collection requires proper methods and basic knowledge of patients.
In fact, the value of the clinical history is more or less influenced by several factors, such as:

- Limitations for obtaining a clinical history in children [12, 14].
- Type of medicine: Non -Immune HSR with Non -Steroid Anti Inflammatory Medicines (NSAIDs) has a high positive prediction value [12, 15].
- When the interval between drug reactions and allergies is reduced for a long time, reliability is reduced.
- Simultaneous administration of several drugs can confound the usefulness of the clinical history.
- Very heterogeneous clinical presentation of ADRs. The algorithms that use clinical history data in pharmacovigilance systems also lack diagnostic sensitivity [12, 16].

Nevertheless, interviewing the patient and taking an accurate clinical history are essential in the diagnosis of drug allergy for several reasons: -

- If the patient has symptoms inconsistent with an allergic reaction (e.g. Diarrhoea), the diagnosis of an allergic reaction is established.
- Avoid diagnosing allergies in patients without allergy tests.
- Differentiate which patients require allergy testing.
- Choose the best time to perform allergy tests.
- Decide what tests to perform, what drugs to use and in what order.
- Provide recommendations to the patient after the examination is completed.

IV. Epidemiology

The incidence of allergic rhinitis based on the doctor's diagnosis is approx. 15%, but based on patients with nasal symptoms, the prevalence is estimated to be as high as 30%. AR is known to peak in the second to fourth decade of life and then gradually decline. [1, 17] The incidence of AR is also quite high in the paediatric population, making it one of the most common chronic paediatric diseases. According to the International Study of Asthma and Allergy in Children, 14.6% of children aged 13 to 14 years and 8.5% of children aged 6 to 7 years have symptoms of rhino conjunctivitis associated with allergic rhinitis. [1,

18] Seasonal allergic rhinitis is more common in children, while chronic rhinitis is more common in adults. [1, 19]

A 2018 systematic review estimated that 3.6% of adults were absent from work and 36% had reduced work performance due to allergic rhinitis. Economic evaluations suggest that indirect costs associated with lost labor productivity account for the majority of the cost burden of AR. [1,20]

Risk factors for AR include specific family history, male gender, allergen-specific IgE, serum IgE greater than 100 IU/ml before age 6 years, and higher socioeconomic status. [1,21] Research in young children suggests that those exposed to food or formula and/or heavy exposure to cigarette smoking [1, 22] in the first few years of life are at greater risk of developing AR. Although many recent studies have evaluated the association between pollution and the development of AR, no significant association exists. Interestingly, several factors have been identified that may have a protective effect on the development of AR**.**

There is a growing concern about the impact of the farm effect on the development of allergies, with a meta-analysis of eight studies showing that subjects who lived on a farm in their first few years of life had a 40% lower risk of allergies. [1, 23]

Regarding the epidemiology of AR, factors such as prevalence, disease classification, allergen sensitization, comorbidities, risk factors, genetic susceptibility, and cost have been widely discussed [24, 25].

The prevalence of AR continues to increase globally, particularly in low- and middle-income countries, ranging from 1.0% to 54.5% [24, 25, 26].

The prevalence of AR among 3-year-olds is approximately 5%, increasing with age from 8.5% in 6-7-year-olds to 14.6% in 13-14-year-olds and reaching over 11.8% at 46% in 2019 in the 44-year-old group [24, 25].

Of note, the prevalence of AR is higher in prepubescent males than in females, but this trend reverses after puberty [24, 27].

A systematic review and meta-analysis showed that in children younger than 11 years, significantly more boys than girls had symptoms of rhinitis (male: female ratio 1.21, 95% CI 1.17-1.25), while adolescents (aged 11 to 18 years) males were significantly less affected than females (male: female ratio 0.90, 95% CI 0.85-0.95) [24, 27].

Several risk factors for AR have been identified, including antibiotic use, air pollution, and maternal and paternal smoking, etc. [24, 25].

A recent large-scale meta-GWAS on AR of European origin identified a total of 41 AR risk loci, including TLR1, TLR10, GATA3, IL33, NFKB1, etc.

These loci are associated with innate and adaptive immune pathways and bridge environmental insults and cellular responses [24, 28].

Risk and protection factors in the context of genetic sensitivity and obvious genetic modification have given a lot of evidence [24, 29].

The two most important observations of scars are "Brothers and Sister Effects" and "Agricultural Effects", which leads to "hygiene assumptions" and later caused "the hypothesis of biodiversity" [24, 29].

Given the paradigm shift from specific sensitization to barrier dysfunction, future epidemiological studies need to evaluate and refine these hypotheses. Encouragingly, now there are more options than ever to characterize the environmental and other factors, such as “omics” technologies in microbiology and metabolism [24, 29]

Epidemiology in India

Incidence of allergic rhinitis in different regions Indian region:

India has about 20% of the world's population, a total of 1.35 billion people. [30, 31] Epidemiology Studies show an escalation in the incidence of allergic diseases in India over the last twenty years. Among non-communicable health conditions, allergic diseases such as allergic rhinitis (AR) and asthma appear to have increased in prevalence in India over the past few decades.

Nevertheless, with a population of over 1.3 billion allergic rhinitis, asthma and atopic dermatitis remain significant and are exacerbated by unmet need for skilled allergy specialists and deficiencies in health infrastructure.

There are considerable regional differences in prevalence of allergic diseases among different ethnic groups, geographic regions of India and the reason for this difference is currently unclear. The prevalence of allergic rhinitis is high, accounting for about 55% of all allergies situation. In addition, about 20-30 percent Indians suffer from at least one allergy Illness. Also, the frequency of rhinitis in India is 20% to 30%. [30, 32]

Variations in prevalence based on Urban vs. Rural:

Currently the factors that increase the susceptibility to atopic and allergic diseases and those who protect against them are not been clearly defined. However, there is evidence that genetic factors, in conjunction with cultural and environmental factors such as diet, exposure to smoke, air pollution and residence in urban areas, may play a role in influencing the illness. [30, 33] Environmental tobacco smoke (ETS) is a major concern in both rural and urban households.

Research conducted in Chandigarh, located in the state of Punjab, revealed that young people living in homes where their parents smoked experienced an increased incidence and severity of asthma compared to households with a smoke-free environment. [30, 34] Nevertheless, due to the insufficient availability of comprehensive epidemiological research in India, especially in rural and suburban areas, this figure may not accurately reflect the true extent of this disorder.

Distribution of allergic rhinitis by age and gender:

According to the International Study of Asthma and Allergies in Childhood (ISSAC) Phase 1 was conducted in 1998, nasal symptoms in India were reported in 12.5% of children aged 6 to 7 years The group of 13 to 14-year-olds makes up 18.6 percent. [30]

In addition, allergic rhino conjunctivitis was observed in 3.3% and 5.6% of the children in the respective age groups. In the ISSAC phase 3 study conducted in 2009, the incidence of nasal symptoms increased 12.9% and 23.6% among children aged 6-7 and 13-14 years. Furthermore, the spread of allergic rhino conjunctivitis increased to 3.9% and 10.4% in the same age groups.

Over 15 years, there has been a consistent upward trend in allergic rhinitis among children aged 6-14 years. [30, 35] Allergic rhinitis is associated with multiple co-existing conditions, including asthma, sinusitis, otitis media, atopic dermatitis and nasal polyps. [30, 36]

V. Aetiology and Risk Factors

Common Allergens That Cause Allergic Rhinitis

Allergic rhinitis is often caused by exposure to year-round or seasonal allergens indoors or outdoors grass pollen, trees and weeds are the main causes of seasonal allergic rhinitis, house dust mites, pets and mold are the main causes of year-round AR. However, in tropical and subtropical regions, pollen can become a year-round allergen. [37]

1. Pollen: Pollen originating from a variety of plants, including grasses, trees and weeds, stands as a notable reason for seasonal allergic rhinitis, notably during the spring and early summer seasons. [38]
2. House Dust Mites: House dust mites, particularly Dermatophagoides pteronyssinus and Dermatophagoides farinae, thrive in India's humid climate. They are present year-round in bedding, carpets and upholstered furniture and are therefore a significant trigger of perennial allergic rhinitis. [38,39]
3. Mold: Warm and moist environment, prevalent in many parts of India, leads to the proliferation of mold spores. Mold allergy may cause AR, especially in monsoon season when humidity is high. [38, 39]
4. Allergens for pets: Home pets, such as cats and dogs serve as common sources of allergenic substances. Proteins found in their skin cells, urine and saliva can cause symptoms of allergic rhinitis in people. [38, 39]
5. Air quality problems: Increased air pollution level in many Indian cities can irritate the nasal passage and exacerbate manifestation of AR. Emission of particulate matter from vehicles and industrial pollutants are among the factors contributing to this problem.

[38, 39]

6. Fungal spores: Fungal spores found in damp environments such as bathrooms and basements can also cause allergies and contribute to the development of allergic rhinitis. [38, 39]

Environmental factors and genetic predispositions factors that cause allergic rhinitis:

Risk factors for allergic rhinitis (AR) often include environmental exposure and genetic factors, many emerging environmental, social and behavioral risks factors such as proximity to waste disposal the site's to residential areas or the closeness to vehicle traffic while travelling to home and exposure to artificial conditions at night like lighting, are connected to AR. Several environmental factors that contribute to development of asthma and chronic rhino sinusitis (CRS) are related to disruption of interaction between epithelial barrier, particles, allergens and microorganism. [40]

In atopic asthma and AR with widespread type 2 biased inflammation is characterized by the recruitment of eosinophils, basophils and T cells, and cytokines release. Epithelial cells come in contact with

microorganisms and that's it is increasingly clear that these microorganisms play important role in inflammatory diseases. When it comes to risk of these conditions, genetic inheritance estimates to account for 25-80% of the risk for asthma and up to 90% risk for AR.

The development of allergic rhinitis (AR) is associated with complex factors interactions between genetic susceptibility and exposure to various environmental factors, the main focus is on the allergens involved. [30, 41] There is a genetic factor in AR, it strongly supported by isolation studies, studies involving twins. Recently, there has been a great deal of interest in genes that may play a role in allergic rhinitis (AR). Over the years, more than 100 genes have been linked to atopic conditions, with no single gene accounting for more than 75% of the observed function. [30, 42]

VI. At-risk groups:

Effects of allergic rhinitis on kids and teens in India: Allergic rhinitis can significantly affect the well-being of kids and teens in India. It can lead to negative impacts on their school success, overall happiness, regular attendance at school, other health problems they might have, mental and social health, and the financial situation of their families. It's crucial to recognize and address these issues to improve the overall health and well-being of these at-risk groups.

a. School Success: The symptoms of allergic rhinitis, such as stuffy nose, sneezing, and tiredness, can make it hard for kids and teens to focus and get enough sleep. These difficulties can result in lower grades, more educational challenges, and poor academic performance.[43]

b. Life Satisfaction: Long-term allergic rhinitis can greatly reduce the quality of life for young people. The ongoing nature of the condition, along with uncomfortable symptoms like itching, a runny nose, and a loss of smell, can limit their daily activities and overall happiness.[44]

c. Absenteeism: Severe allergic rhinitis episodes can cause kids and teens to miss school, leading to educational delays. Regular absences can hinder their learning and social life.

d. Mental and Social Health: Dealing with chronic allergic rhinitis can also affect mental and social health. Teens might feel embarrassed by visible symptoms like sneezing and a runny nose, which can lower their self-confidence and affect their relationships with peers.

Effects on senior citizens: Allergic rhinitis can significantly affect the health and happiness of older people in India. This effect covers many areas, including health problems, lower life quality, reduced mental sharpness, higher medical needs, emotional upset, and a greater chance of falling. It's crucial to recognize and tackle these problems to improve the health and well-being of this vulnerable group.

a. Health Problems: Allergic rhinitis can worsen existing health issues in seniors, increasing the risk of serious problems like respiratory infections and worsening of chronic lung conditions such as asthma or chronic obstructive pulmonary disease (COPD). [30, 45]

b. Impaired Mental Function: The ongoing symptoms of chronic allergic rhinitis can harm mental function in the elderly. Poor sleep and the pain associated with the condition might play a role in the decline of mental abilities and memory problems.

Effects on to be mothers: Allergic rhinitis in expectant mothers in India can lead to complications during pregnancy, disturbances in sleeping habits, doubts about taking medication, possible risks to the baby's health, stress, and a lower quality of life overall. It's crucial to identify and tackle these problems to guarantee the health and development of both the pregnant woman and the baby.

VII. Geographical variations:

Regional differences in the prevalence and in India: Variations in the occurrence and characteristics of allergic rhinitis across different regions of India have been noticed in the studies conducted. It is observed that in different regions of India the features and occurrence of allergic rhinitis shows some clinic-seasonal differences mainly due to geographical location, climate, air quality and region specific practices. Regions in the Northern parts of India, like Delhi and Punjab face alarming air pollution levels which in turn increases the prevalence of allergic rhinitis. Most of these areas also have a high pollen and dust mite content which also adds to the aggravation of allergic rhinitis symptoms. [30, 46] But Southern states like Kerala, have a gentler spectrum of climate, better air quality and as a result the reports suggest lower number of allergic rhinitis cases there. However, other types of allergens like mold spores or certain plant pollens can still cause an allergy in those regions. [30, 47] Further, certain living styles such as habits in diet, housing premises, etc. could also influence the prevalence and features of the allergic rhinitis.

VIII. **Pathogenesis**

The underlying mechanisms responsible for nasal symptoms vary according to the type of rhinitis. Allergic rhinitis specifically occurs in individuals with a genetic predisposition to allergies. Although environmental allergens are ubiquitous, only those with an inherent tendency to become sensitized exhibit symptoms. In sensitized individuals, repeated exposure to air borne allergens activates B cells and promotes the maturation of plasma cells, leading to the synthesis of specific IgE antibodies. These IgE antibodies attach to particular receptors on mast cells and basophils. When the sensitizing allergen binds to the cell-bound IgE, it triggers the release of various chemical mediators that elicit allergic symptoms. [48, 49] Activated mast cells release pre-formed histamine, along with newly synthesized leukotrienes, prostaglandins, kinins, and other inflammatory substances [50]. This release of mediators results in an acute hypersensitive reaction characterized by symptoms such as a scratchy throat, nasal discharge, and congestion, primarily due to the vascular leakage of plasma proteins. [48, 51] Following exposure to an allergen, a late-phase response occurs, marked by the continued release of inflammatory agents that prolong nasal symptoms. During this phase, cytokines and chemokines are produced, attracting additional inflammatory cells that further release inflammatory mediators, exacerbating nasal symptoms and priming the nasal mucosa for heightened responses to future allergen exposures. Atopic rhinitis is prevalent in nearly 50% of individuals with asthma. The primary vasoactive mediators involved are histamine and cysteinyl-leukotrienes, which are released by eosinophils, T cells, mast cells, and basophils, these cells also play a crucial role in regulating IgE production both locally and systemically, as well as in mediating interactions with the immune system and communicating with the bone marrow. [48, 52, 53]

Early-phase reaction: Upon exposure to an allergen, individuals who have been sensitized typically experience the early or immediate phase reaction within minutes, a response that persists for approximately 2 to 3 hours. A critical component of this early phase is the degranulation of mast cells, which are prevalent in the epithelial layer of the nasal mucosa in sensitized individuals. These mast cells are rapidly activated upon subsequent exposure to the same allergens. The early phase reaction is characterized by the crosslinking of allergen-specific IgE antibodies on the surface of mast cells, leading to their degradation and the subsequent release of various pre formed and newly synthesized mediators. Histamine, a key mediator in allergic rhinitis activates sensory nerve endings in the trigeminal branch of the fifth cranial nerve, resulting in sneezing. Furthermore, histamine stimulates mucous gland activity, contributing to rhinorrhea, while permeability. [54]

Late-phase reaction: The late phase reaction typically occurs 4 to 6 hours following antigen exposure and generally follows the early phase response. Symptoms associated with the late phase can last for approximately 18 to 24 hours and include persistent sneezing, rhinorrhea, and ongoing nasal congestion. This phase is primarily characterized by an inflammatory response, marked by the infiltration of various inflammatory cells, including basophils, eosinophils, and T lymphocytes. Mast cells play a pivotal role in this phase by producing and releasing a variety of cytokines and chemokines, notably IL-4 and IL-13, which are essential for coordinating the late phase response. Additionally, the late phase is believed to be influenced by several other mediators, such as platelet-activating factor, major basic protein (MBP), and eosinophil cationic protein [55, 56]

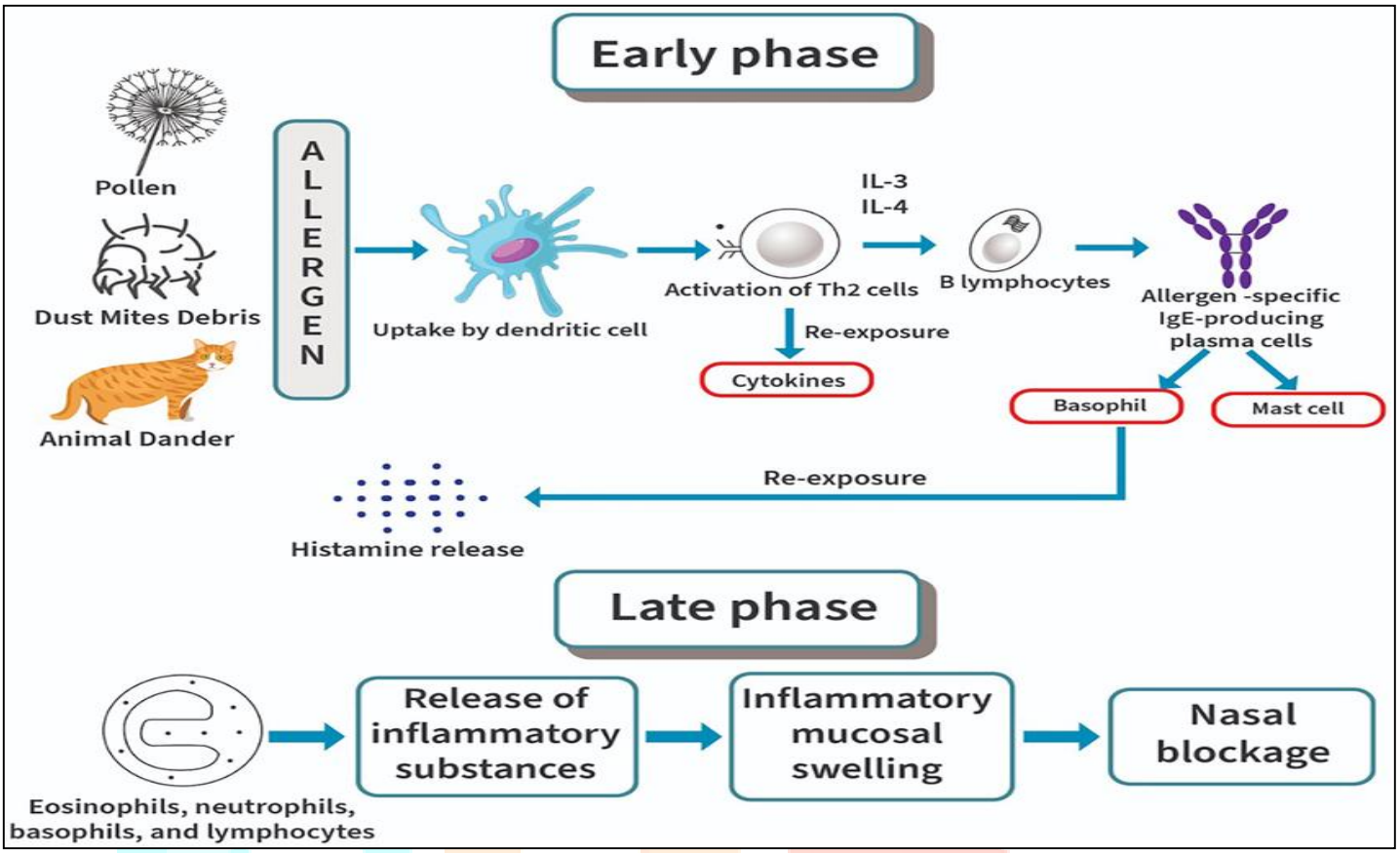

Fig. 1 Early and Late Phase in Allergic Rhinitis

IX. Evaluation

While there is a scarcity of research focused on distinguishing between various types of rhinitis, a detailed and systematic patient history typically leads to an accurate diagnosis. Clinicians should prioritize an assessment of symptoms, including their duration, potential exposures, intensity of reactions, patterns, and chronicity; identify triggers, consider seasonal fluctuations, evaluate environmental factors, investigate allergies; and review the patient's medical history, which encompasses trauma, familial patterns, and previous treatments, as well as current therapeutic interventions, An acute onset lasting one week or less generally presents a narrow differential diagnosis, often indicating a viral cause, an acute flare-up of allergic rhinitis, or, less frequently, the presence of a foreign body, particularly in pediatric cases where symptoms may be unilateral and accompanied by purulent discharge. In contrast, the differential diagnosis for chronic symptoms is considerably more extensive.

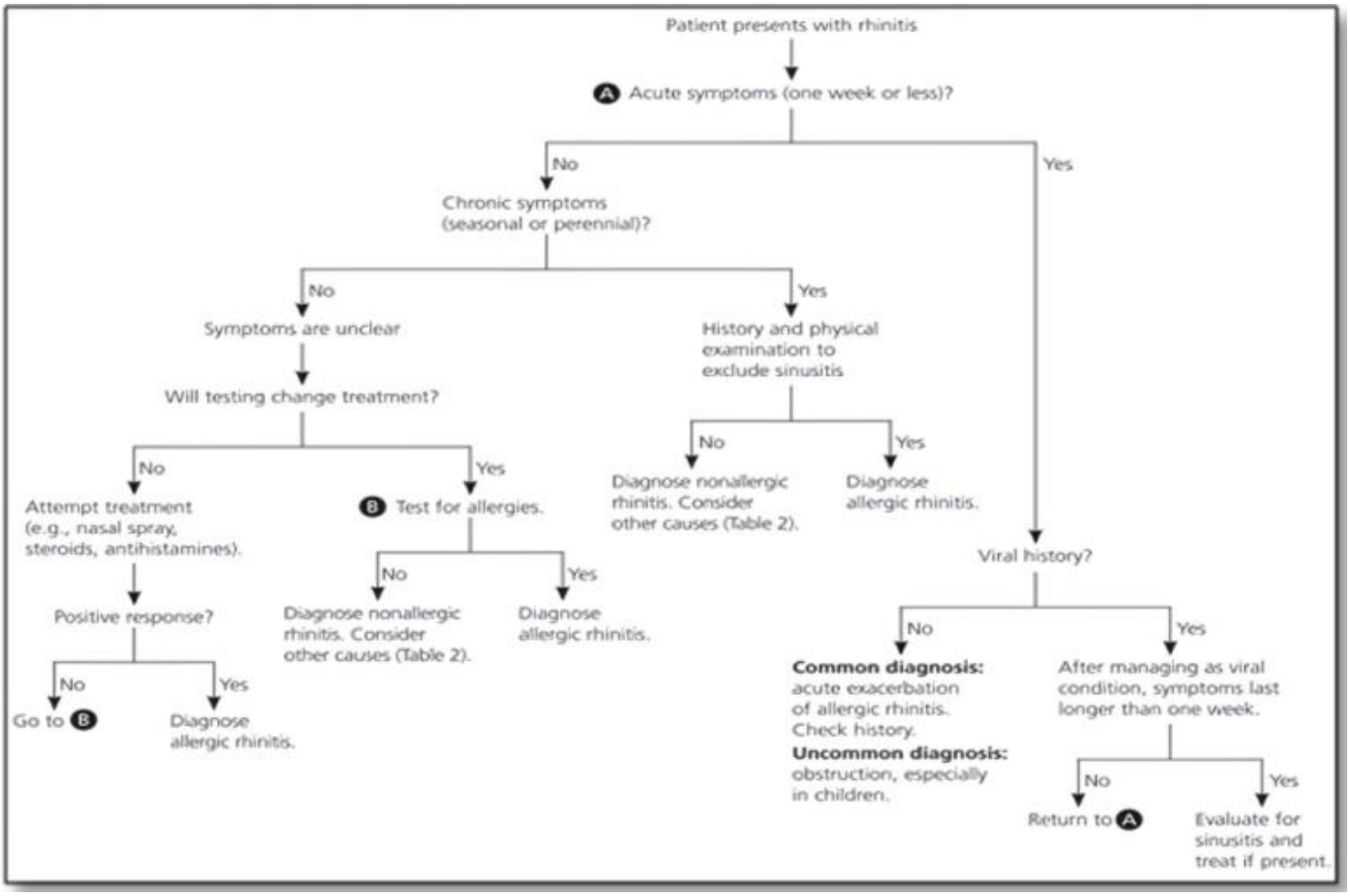

Fig. 2 [57]

X. Allergy Testing

Skin prick (scratch) test: in this procedure, a healthcare professional employs a fine needle to puncture the skin on the forearm or back with potential allergens. Alternatively, droplets of allergens may be applied to the skin, followed by a device. that lightly scratches and punctures the area, allowing the liquid to penetrate the skin. Reactions, such as erythema, generally manifest within 15 minutes of exposure. The response may include a rash or elevated, circular areas known as wheals. This test is utilized to assess sensitivities to airborne allergens, food allergens, and penicillin. Skin prick tests are the most prevalent form of allergy testing.

Intradermal skin test: An intradermal skin test may be conducted if the results of the skin prick test are negative or ambiguous. In this test, a healthcare provider injects minute quantities of an allergen into the epidermis, the outer layer of the skin. This method is employed to evaluate allergies to airborne irritants, medications, and insect stings.

Patch test: This test is designed to identify the cause of contact dermatitis. The healthcare provider applies drops of an allergen to the skin and covers the area with a bandage. Alternatively, a patch containing the allergen may be affixed to the skin. The bandage remains in place, and the patient returns to the provider's office within 48 to 96 hours for the removal of the bandage, during which the provider examines the skin for any rash or other reactions.

Blood (IgE) test: In this procedure, a blood sample is collected and sent to a laboratory. The lab introduces allergens to the sample and quantifies the levels of immunoglobulin E (IgE), an antibody associated with allergic responses. A total IgE test assesses the overall concentration of IgE antibodies, while a specific IgE test evaluates the amount of IgE produced in response to a particular allergen.

Oral challenge test: This test is conducted exclusively under the supervision of a healthcare provider in their office. Individuals with suspected food or drug allergies ingest a small quantity of the potential allergen. Typically administered by an allergist, this test requires medical oversight to manage any symptoms that may arise during the challenge. [58, 59, 60]

Nasal Provocation Test: Nasal provocation tests are recommended for patients who are unable to participate in oral or inhalation testing due to bronchial obstruction and severe asthma, as well as for those exhibiting classic symptoms of NSAID hypersensitivity localized to the upper airways. The results of pulmonary function tests do not restrict the administration of nasal aspirin challenge tests. Following

the application of lysine-aspirin into the nasal passages, the patient's response is assessed by documenting nasal symptoms using a visual analogue scale, alongside one
of the following objective evaluation methods: acoustic rhinometry, active anterior rhinomanometry, or peak nasal inspiratory flow (PNIF) A positive response is characterized by the emergence of nasal symptoms, including rhinorrhoea, nasal congestion, and sneezing, along with a 25% reduction in total nasal flow compared to baseline measurements obtained via acoustic rhinometry, or a 40% bilateral decrease in inspiratory nasal flow relative to baseline values measured with rhinomanometry or a PNIF meter. In the United States, an alternative to lysine-aspirin is the use of a ketorolac solution administered as a nasal spray. The nasal provocation test is considered safe and infrequently leads to systemic reactions. Nevertheless, a negative result does not exclude the possibility of aspirin hypersensitivity, and it is advisable to conduct an oral aspirin provocation for a conclusive diagnosis. [61]

Fig. 3 Intradermal Skin

Fig. 4 Blood IgE Test

Fig. 5 Skin Prick Test

Fig. 6 Patch Test

XI. Conclusion:

The diagnosis of allergic rhinitis (AR) necessitates a thorough and systematic methodology that encompasses patient history, clinical assessment, and various diagnostic evaluations. A comprehensive patient history is essential, as it aids clinicians in recognizing significant patterns and identifying potential allergens. Additionally, a targeted physical examination can uncover characteristic indicators of allergic inflammation. Recent advancements in diagnostic methodologies, such as skin prick testing, specific IgE measurements, and innovative approaches like nasal provocation test, have markedly enhanced diagnostic precision and facilitated a more tailored treatment strategy. Nonetheless, challenges persist, particularly in differentiating AR from other types of rhinitis and managing the variability in diagnostic results. Ultimately, achieving an accurate diagnosis of allergic rhinitis depends on a judicious integration of clinical expertise and suitable testing, aimed at informing effective and personalized management plans. Future developments in diagnostic methods and a deeper understanding of the underlying pathophysiology of AR may further improve diagnostic accuracy, optimize treatment results, and enhance the overall quality of life for affected individuals.

XII. Acknowledgment

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