



# An Insight about Diagnostic Modalities of Allergic Rhinitis

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## Abstract

**Background:** Allergic rhinitis (AR) is an upper respiratory tract inflammatory disease induced by IgE-mediated reaction in atopic subjects. This inflammatory disease occurs as an immune response of the nasal mucosa to airborne allergens and involves nasal congestion, watery nasal discharge, itching of the nose and sneezing. According to the rising pattern of AR incidence as well as its effects on patient's quality of life and its economic burden on communities, it has been turned into an important public health problem. AR has been classified as seasonal which occurs during certain season or perennial which occurs throughout the year. However, this classification is not applied on all cases. For example, some allergens such as pollen may trigger allergic rhinitis to be seasonal in cooler climates, but perennial in warmer climates. Also, patients with multiple "seasonal" allergies may suffer from allergic symptoms throughout most of the year. AR is often under-recognized owing to poor awareness of patients about the disease, limited access to allergic experts and confounding diagnosis with other clinical conditions such as the common cold. The diagnosis of AR is made by taking a detailed history supported by careful clinical examination. Allergy testing is also important for confirming that underlying allergy is the cause of the rhinitis. Other tests such as nasal allergen challenge, CT scans, evaluation of nasal nitric oxide and ciliary beat frequency, nasal smears and cultures, and analysis of nasal fluid for  $\beta$ -transferrin may be required to include or exclude different forms of rhinitis. Although history taking and physical examination are needed to establish the clinical diagnosis of AR, further diagnostic tests are necessary to confirm that the underlying cause of rhinitis is allergy. Skin testing is considered the primary method for identifying specific allergic triggers of rhinitis.

**Keywords:** Allergic Rhinitis

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## Introduction

Allergic rhinitis (AR) is an upper respiratory tract inflammatory disease induced by IgE-mediated reaction in atopic subjects. This inflammatory disease occurs as an immune response of the nasal mucosa to airborne allergens and involves nasal congestion, watery nasal discharge, itching of the nose and sneezing **(1)**.

According to the rising pattern of AR incidence as well as its effects on patient's quality of life and its economic burden on communities, it has been turned into an important public health problem **(2)**.

## Epidemiology:

In spite of being a very prevalent disease, AR is often underdiagnosed or undertreated by physicians. The prevalence of AR is increasing globally. About 10% to 40% of the global population is affected by allergic rhinitis and is on the rise **(2)**.

Data suggest seasonal allergic rhinitis (SAR) is identified in roughly 10% of the normal population while perennial allergic rhinitis (PAR) is observed in 10–20% of the normal population **(3)**.

## Classification:

AR has been classified as seasonal which occurs during certain season or perennial which occurs throughout the year. However, this classification is not applied on all cases. For example, some allergens such as pollen may trigger allergic rhinitis to be seasonal in cooler climates, but perennial in warmer climates. Also, patients with multiple "seasonal" allergies may suffer from allergic symptoms throughout most of the year **(4)**.

Therefore, "The Allergic Rhinitis and its Impact on Asthma (ARIA)" guidelines have classified allergic rhinitis according to duration of symptoms into (intermittent or persistent) and

according to severity of the disease into (mild, moderate or severe) **(5)**.

According to symptom duration, the "intermittent" allergic rhinitis has been defined as symptoms that occur less than 4 days per week or for less than 4 consecutive weeks, while "persistent" allergic rhinitis has been defined as symptoms that persist more than 4 days per week or for more than 4 consecutive weeks **(6)**.

Symptoms are classified as mild when patients don't have any sleep troubles and are able to do their usual daily activities and classified as moderate/severe if they markedly affect sleep or usual daily activities. It is important to identify the severity and duration of symptoms as this will help the management of the disease **(5)**.

## Triggers of allergic rhinitis:

Allergic rhinitis is triggered by breathing in tiny particles of allergens. It's not fully understood why some people are oversensitive to allergens, although they are more likely to develop an allergy if they have family history of allergic disease and they are said to be atopic. Their increased immune response to allergens leads to increased production of IgE antibodies **(6)**.

Environmental factors may also have a role. Studies have reported certain factors that may increase the risk of developing allergies during childhood, such as growing up in a house where people smoke or being exposed to house dust mites at a young age **(7)**.

## Diagnosis of allergic rhinitis:

AR is often under-recognized owing to poor awareness of patients about the disease, limited access to allergic experts and confounding diagnosis with other clinical conditions such as the common cold. The diagnosis of AR is made by taking a detailed history supported by careful clinical examination. Allergy testing is also important for confirming that underlying allergy is the cause of the rhinitis **(8)**.



Other tests such as nasal allergen challenge, CT scans, evaluation of nasal nitric oxide and ciliary beat frequency, nasal smears and cultures, and analysis of nasal fluid for  $\beta$ -transferrin may be required to include or exclude different forms of rhinitis (9).

### Clinical history

The clinical history should include symptoms such as nasal discharge, nasal blockage, itching or sneezing, the place and the time of their occurrence, together with any exacerbating or relieving factors. Other symptoms in the chest, ears, throat, eye, gut or skin also must be included. In addition, family history of allergic diseases and history of any previously or currently used medication or any surgical intervention should all be noted. (10).

Asking about seasonality of symptoms, indoors/outdoors location, work location and occupational exposure and relationship to potential triggers which can significantly affect the patient's quality of life should also be included in the history (9).

### Clinical Examination

An overall examination of the patient is necessary because rhinitis is usually associated with other co-morbidities. Growth assessment in children is very important, as severe airway problems are usually associated with reduced growth. The presence of facial features such as conjunctivitis, nasal allergic crease, allergic salute or double creases beneath the eyes (Dennie–Morgan lines) are all suggestive of allergic problem (11).

Nasal examination is needed for patients presented with moderate to severe symptoms or those with uncontrolled symptoms in spite of optimal treatment. This examination should include observation of the external features followed by internal examination. Observing the position of the nasal septum, as well as the size and color of the inferior turbinates, together

with examination of the nasal mucosa and detection of any secretions, polyps, bleeding, tumors, crusts or foreign bodies should be included (9).

The classic appearance of the nasal cavity of AR patients is swollen pale bluish inferior turbinates with profuse clear secretions. However, those features are not specified to AR disease and in many times the nose may appear normal. Patients with nasal polyps, bleeding, tumors, crusts and septal lesions should be referred to an ear, nose and throat specialist (9).

Owing to the frequent co-occurrence of Asthma and AR, patients with AR should usually be assessed for having asthma. This is done by asking patients about symptoms such as chest wheezes, cough or shortness of breath. An objective measurement with spirometry can also be used in some of those cases. Also, skin examination for concurrent atopic dermatitis should be done (12).

### Diagnostic tests

Although history taking and physical examination are needed to establish the clinical diagnosis of AR, further diagnostic tests are necessary to confirm that the underlying cause of rhinitis is allergy. Skin testing is considered the primary method for identifying specific allergic triggers of rhinitis (5).

#### 1- Skin testing:

##### a) Skin-prick testing (SPT)

Skin prick testing is done by placing a drop of an extract of a specific allergen on the skin of the forearms or the back, then pricking the skin through the drop using sharp pointed lancet to introduce the extract of allergen into the epidermis. Within 15–20 minutes, a wheal and flare will be formed if the test is positive. This local reaction is measured and compared with

histamine used as positive control and normal saline used as negative control. Testing is typically performed using the allergens related to the patient's environment. SPT is contraindicated in certain conditions as in cases presented with extensive skin disease (e.g., atopic dermatitis) and in specific skin conditions such as urticaria and severe dermatographism. It also should be done cautiously by experienced practitioners in case of pregnancy, severe asthma, history of anaphylaxis, and for patients treated with drugs that may increase the risk of extensive allergic reactions such as beta-blockers. **(13)**

#### **b) Intradermal skin test**

The diluted extract solution of each allergen is injected intradermally using a short needle to make a wheel, similar to conducting a tuberculin test. The concentration of allergens is much higher at 1 to 500 to 1 to 1000. Histamine is used as a positive control while saline is used as a negative control. The reaction is observed for 10 minutes. Formation of a wheel of a minimum 5mm, or any reaction larger than the negative control is considered a positive test **(14)**.

#### **c) Skin Patch test**

A patch with the allergen is placed on the skin, usually the back, for 48 hours. The test is then read 15 to 60 minutes after the patch is removed **(14)**.

### **2- In vitro testing**

#### **a) Serum total IgE (tIgE)**

Measuring total serum IgE for purposes of diagnosis and management of allergic diseases is variable. It is important to recognize that levels of total IgE rarely provide information about IgE to specific allergens and its importance is restricted to its ability to identify patients with atopy in general **(15)**.

#### **b) Serum allergen specific IgE (sIgE)**

An appropriate alternative to skin prick testing is the use of allergen specific IgE tests such as immunosorbent assay and radioallergosorbent tests (RASTs) that provide a measure of the patient's specific IgE level against particular allergens. Specific IgE testing is effective in identifying allergic patients and may correlate with severity of the disease symptoms. It also helps in selection of candidates for immunotherapy. This test alone cannot provide a definitive diagnosis of allergy due to many false positive results without appropriate clinical history **(16)**.

#### **c) Nasal specific IgE**

Specific IgE has been demonstrated in the nasal mucosa of AR patients. Some patients show negative SPT and normal levels of serum sIgE in spite of clinical history suggestive for AR. These patients have a type of AR called local allergic rhinitis (LAR) characterized by the presence of a localized allergic response in the nasal mucosa, with local production of sIgE without positive SPT or serum sIgE elevation **(17)**.

#### **d) Nasal provocation tests (NPT)**

Standardized nasal provocation testing (NPT) has been demonstrated to be a safe and very useful test in the diagnosis of AR. However, its use has been limited to scientific research and has not been widely used as a standard diagnostic test in the clinical practice **(18)**.

During NPT, the nasal mucosa is exposed to an airborne substance suspected to cause symptoms in the tested patient. The resulting reactions are assessed in a controlled and standardized manner. Nasal symptoms including nasal secretions, itching, sneezing and nasal obstruction are observed together with ocular, bronchial, cutaneous, and systemic reactions. For obtaining objective data on the changes in the nasal airflow and patency after the challenge, anterior rhinomanometry and

acoustic rhinometry have been used in the standard protocol of NPT (18).

The test is contraindicated in cases of acute bacterial or viral rhinosinusitis, AR exacerbation, history of anaphylaxis, and pregnancy (18).

### Differential diagnosis:

The differential diagnosis for AR includes other forms of rhinitis that are not allergic. The non-

allergic rhinitis (NAR) includes vasomotor rhinitis triggered by temperature changes, infectious rhinitis commonly seen in children, cerebrospinal fluid leak, non-allergic rhinitis with eosinophilia syndrome (NARES), chemical rhinitis, rhinitis of pregnancy, drug-induced rhinitis and Autoimmune rhinitis (16)

**Conflict of Interest:** None

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