

## Pathogenesis Of Allergic Rhinitis (a Review)

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### Abstract:

Allergic rhinitis is widely spread disease and has strong relation with asthma. Almost all asthma patients have allergic rhinitis symptoms. The prevalence of asthma in allergic rhinitis patients is high. Allergic rhinitis and asthma are not separate disease entity, therefore concurrent asthma in allergic rhinitis patients and concurrent allergic rhinitis in asthmatic patients should be identified and both upper and lower airway allergy should be treated simultaneously. Allergic rhinitis has serious impact on health, allergic rhinitis clinically produces symptoms like sneezing, rhinorrhea, nasal itching and nasal obstruction. And this affects overall health and daily routine of patients. Treatment available for allergic rhinitis is avoidance of allergens, Oral antihistamines, Intranasal antihistamines, Intranasal corticosteroids, Leukotriene receptor antagonists (LTRAs) and Immunotherapy in modern medicine. But avoidance of allergens which is primary treatment, is practically not possible and other treatment options have their own limitations and drawbacks.

**Keywords:** Hypersensitivity; Allergic rhinitis; Physiopathology; Diagnosis; Therapy; Eosinophils; Asthma; AR

### Introduction:

Allergic rhinitis (AR) is main cause of bronchial asthma. For treating AR it is important to understand the pathophysiology of rhinitis. Treatment options for AR consist of allergen avoidance, pharmacotherapy, immunotherapy and surgery. Allergen avoidance and immunotherapy are theoretically ideal, antihistamines and intranasal corticosteroids will play the main role in the management of AR because no innovative treatment without drawback for AR is developed yet. Patients' main symptom, the duration and severity of AR, patients' compliance, safety of medication and cost-effectiveness should be considered when treatment options are chosen. In conclusion, physicians should be aware of etiology, pathophysiology, symptoms, signs and diseases related to AR in order to make a correct diagnosis and choose a proper treatment option for each patient.

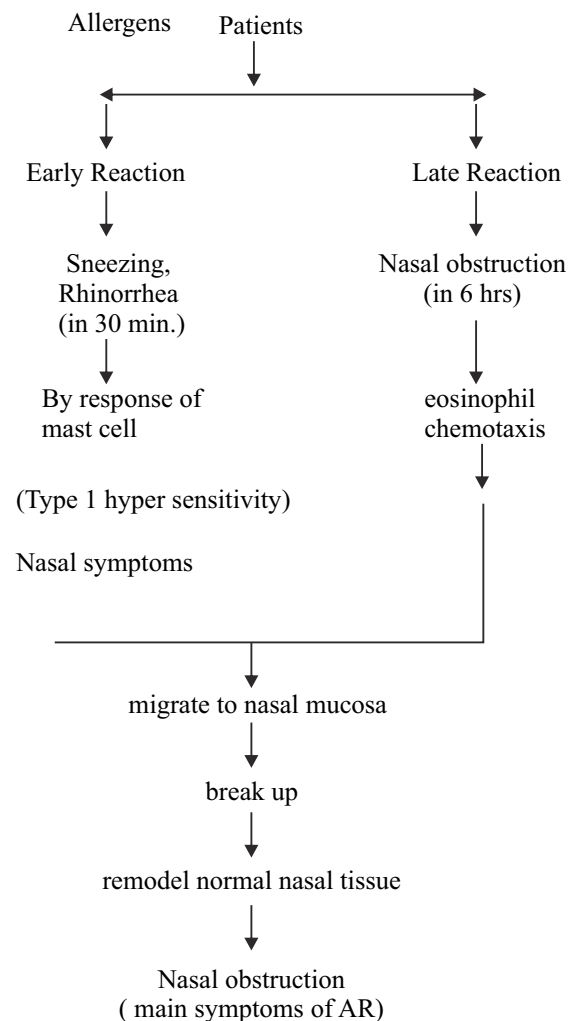
#### ➤ Aim and objectives:

1. To study the literature review of pathogenesis of allergic rhinitis.
2. To study or understand limitations or drawbacks in management of allergic rhinitis by modern medicine.

### Materials And Methods:

#### Pathophysiology Of Allergic Rhinitis-

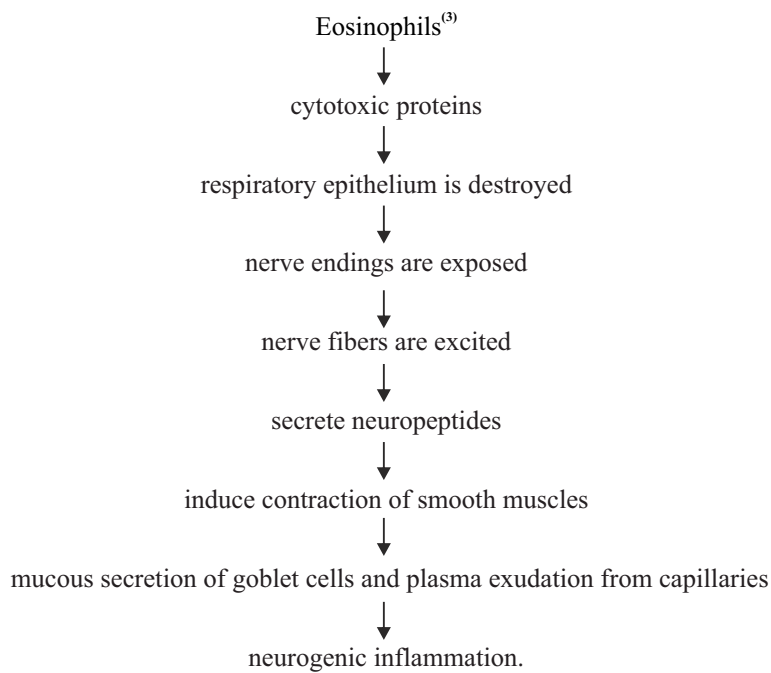
#### Early and late reactions<sup>(1,2)</sup>



When AR patients are exposed to allergens, allergic reactions develop in 2 different patterns according to time sequence. One is the early reaction, in which sneezing and rhinorrhea develops in 30 minutes and disappears. The other is the late reaction, which shows nasal obstruction approximately 6 hours after exposure to allergens and subsides slowly. The early reaction is the response of mast cells to offending allergens (type I hypersensitivity). Stimulated mast cells

induce nasal symptoms by secreting chemical mediators such as histamine, prostaglandins and leukotrienes.<sup>(12)</sup> In contrast to the early reaction, eosinophil chemotaxis is the main mechanism in the late reaction, which is caused by chemical mediators produced in the early reaction. Several inflammatory cells, eosinophils, mast cells and T cells migrate to nasal mucosa, break up and remodel normal nasal tissue,<sup>(13)</sup> and these processes result in nasal obstruction which is the main symptom of AR patients.

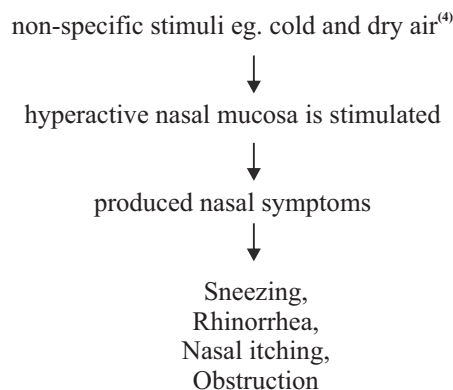
➤ **Neurogenic inflammation<sup>(3)</sup>**



When respiratory epithelium is destroyed and nerve endings are exposed by cytotoxic proteins from eosinophils, sensory nerve fibers are excited by nonspecific stimuli. This makes

the sensory nerve fibers secrete neuropeptides which induce contraction of smooth muscles, mucous secretion of goblet cells and plasma exudation from capillaries.

➤ **Non-specific hyper responsiveness<sup>(4)</sup>**



Non-specific hyperresponsiveness is one of the clinical characteristics of allergic inflammation. Due to eosinophilic infiltration and destruction of nasal mucosa, the mucosa becomes hyperactive to normal stimuli and causes nasal symptoms such as sneezing, rhinorrhea, nasal itching and obstruction.<sup>(15)</sup> This is a non-immune reaction that is not related to IgE. Hypersensitivity to non-specific stimuli such as tobacco or cold and dry air as well as specific allergens increases in AR patients.

#### ➤ Relationship between AR and asthma- “One airway, one disease”

Almost all of the asthma patients have AR symptoms.<sup>(5,6)</sup> The prevalence of asthma in AR patients has been reported to be from 9% to 10% in adult and 28% to 30% in children in India.<sup>(7)</sup>

#### Diagnosis Of Allergic Rhinitis:

The diagnosis of AR is based on a typical history of allergic symptoms and diagnostic tests.<sup>(9)</sup> When two or more symptoms out of watery rhinorrhea, sneezing, nasal obstruction and nasal pruritus persist for  $\geq 1$  hour on most days, AR is strongly suspected. In this situation, disease severity should be classified according to the ARIA guidelines and a confirmative diagnosis should be established by the skin prick test or the serum-specific IgE level. Unilateral nasal stuffiness, mucopurulent rhinorrhea, mucoid post nasal drip, pain, recurrent epistaxis or anosmia is usually not associated with AR.<sup>(8)</sup>

#### ➤ Skin testing (RAST TEST)

Skin testing is the most important to find offending allergens. The skin prick test is usually recommended in clinical practice.

#### ➤ Serum specific IgE level (MAST TEST)

This test has not been widely used because it requires a radioactive isotope and expensive equipment.

#### ➤ Clinical parameters related to asthma

The severity of AR has a positive link with asthma and the risk of asthma incidence in AR patients with elevated serum IgE.<sup>(9,10)</sup>

#### Treatment:

##### ➤ Avoidance

Avoidance of indoor allergens including house dust, mites is sometimes difficult. Avoidance is mandatory for occupational AR.

##### ➤ Pharmacological treatment

The principle of pharmacological treatment is a step wise approach according to the severity and duration. Guidelines are as follows:

1) second- generation antihistamines are preferred to first-generation antihistamines and

2) topical steroids are regarded as the most effective drug for adult and pediatric AR patients.

##### ➤ Oral antihistamines

First-generation antihistamines have some side effects such as sedation, memory impairment and psychomotor dysfunction, which cause many problems in clinical practice. In contrast, second-generation antihistamines have few side effects on the central nervous system.<sup>11</sup> Oral antihistamines are effective in the treatment of rhinorrhea, sneezing, nasal itching and eye symptoms but less effective in nasal obstruction.<sup>12</sup> Terfenadine and astemizole were initially used second-generation antihistamines. These drugs have severe cardiac toxicity.

##### ➤ Intranasal antihistamines

Topical antihistamines have been reported to reduce itching, sneezing and rhinorrhea.<sup>12</sup> However, they are less effective than intranasal corticosteroids and ineffective in eye symptoms.<sup>13</sup>

##### ➤ Intranasal corticosteroids

Since intranasal corticosteroids are not absorbed systemically, they induce few systemic side effects. Budesonide, triamcinolone acetonide, fluticasone propionate, mometasone furoate and fluticasone furoate have been widely used. But we can not use for longer duration. The role of leukotrienes in allergic reactions is well known. The efficacy of LTRA has been demonstrated in asthma. Recently, some studies on the efficacy of LTRAs in AR patients have been reported. Montelukast is effective in reducing nasal and eye symptoms in patients with seasonal AR and improves nasal obstruction comparable to loratadine.<sup>(14)</sup>

##### ➤ Immunotherapy

Subcutaneous immunotherapy is a well established treatment option, the risk of anaphylaxis has led to the development of other administration routes such as the oral, sublingual or nasal route. Immunotherapy is effective in house dust mite and pollen AR of adult and children, prevents asthma in AR patients and reduces new atopic sensitization<sup>(15)</sup>. Common adverse events are local reactions (oral pruritus or swelling) and gastrointestinal problems (nausea, vomiting, diarrhea or abdominal pain), which subside spontaneously or with conservative management. In cases, anaphylaxis is also reported.

#### Other Complications And Comorbid Diseases<sup>(16)</sup>:

1. Allergic conjunctivitis
2. Rhinosinusitis
3. Nasal polyposis

4. Adenoid hypertrophy
5. Eustachian tube dysfunction

#### Discussions:

The prevalence of AR is increasing all over the world approximately 60 million peoples. It is associated with an enormous economic burden causing problems in quality of life such as work/school performance and sleep. Allergens produced nasal symptoms as well as affect bronchial mucosa therefore, AR patients so many times have bronchial hyper responsiveness. This means that since AR and asthma are not separate disease entity, concurrent asthma in AR patients and concurrent AR in asthmatic patients should be indentified and both upper and lower airway allergy should be treated simultaneously. For this purpose disease pathogenesis should be studied. Pathogenesis occurs through Type 1 hyper sensitivity reaction, neurogenic inflammation, non specific hyper responsiveness of nasal mucosa etc<sup>4</sup>. and this produces variety of symptoms which may be mild, moderate to severe. Depending upon this symptoms disease classified into intermittent AR and Persistent AR. After understanding pathogenesis of AR doctor can advice various test like skin prick test, serum immunoglobine test to patients ( MAST and RAST test). It is observed that to avoidance of allergens is primary treatment of AR after that pharmacological treatment like oral antihistamine, intra-nasal corticosteroid, intra-nasal antihistamine and immunotherapy also play important role in management of AR. If we look at symptoms of allergic rhinitis it can be correlated with *Vataj Pratishaya* in *Ayurveda*. And in *Ayurveda* variety treatment of options are available for *Vataj Pratishaya*. It includes *sidhha ghritpana*, *snaihik dhumpana*, *upnaha sweda* as well as *sankar sweda*, *sidhha tail nasya* depending upon *avastha* of patients<sup>(17)</sup>. We can also use *nadi sweda* and *niruha*, *anuvrasana*, *shirobasti* (for *pakva-avastha*). We can advice *snigdha*, *amla*, *ushna*, *laghu ahara* in diet management and treat *Vataj Pratishaya*<sup>(18)</sup>. By prescribing drugs like *Chitrakarhitaki yoga*, *vyoshadi vati* and giving *rasayana chikitsa*, We can boost overall immunity of patients. By giving *Ayurvedic* treatment. we can treat allergic rhinitis more effectively<sup>(20)</sup>.

#### Conclusion:

Allergic rhinitis is widely spread disease and has strong relation with asthma. Almost all asthma patients have allergic rhinitis symptoms. The prevalence of asthma in allergic rhinitis patients is high. allergic rhinitis and asthma are not separate disease entity, therefore concurrent asthma in allergic rhinitis patients and concurrent allergic rhinitis in asthmatic patients should be indentified and both upper and lower airway allergy should be treated simultaneously. Allergic rhinitis has serious impact on health, allergic rhinitis clinically produces symptoms like sneezing, rhinorrhea,

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