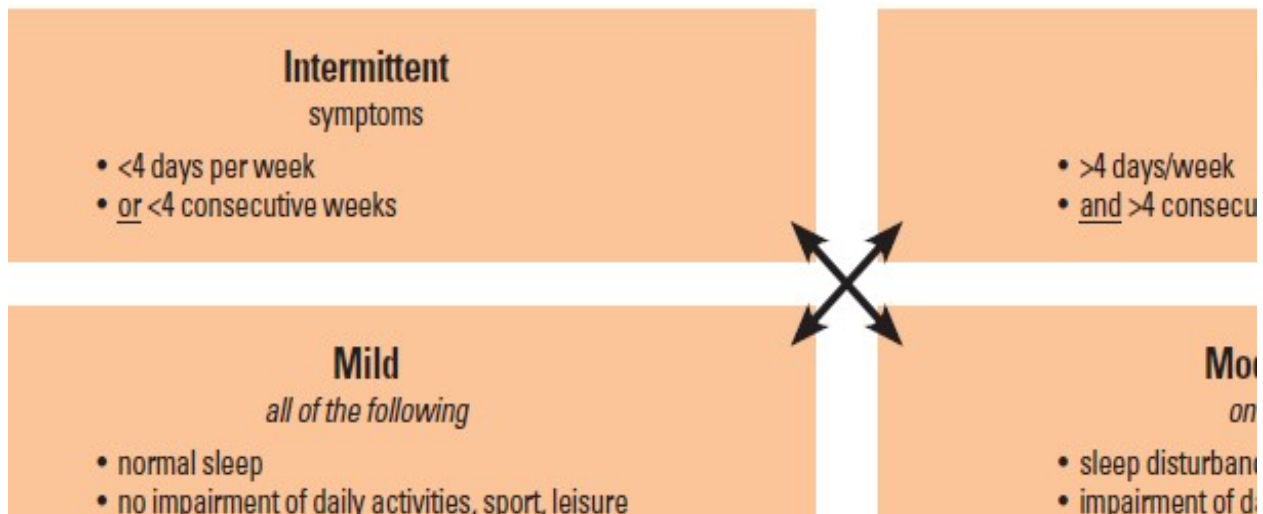


# CHAPTER 1: INTRODUCTION

## 1.1 ALLERGIC RHINITIS

Allergic Rhinitis (AR) is an inflammatory condition of the upper airways mediated by immunoglobulin-E (IgE). The primary clinical symptoms include a runny nose, sneezing, nasal congestion, itching of the nasal passages, and epiphora. Additional symptoms may include sniffing, postnasal drip, an impaired sense of smell, and mouth breathing (Hellings & Fokkens, 2006; Varshney & Varshney, 2015; Di et al., 2016; Ng et al., 2000).



**Fig-1: Symptoms of allergic rhinitis (ARIA Guidelines 2014)**

## 1.2 GLOBAL BURDEN OF ALLERGIC RHINITIS

Allergic Rhinitis (AR) presents a significant global health challenge, with incidence rates varying widely and currently affecting between 20% to 40% of the global population (Solé et al., 2015; Settipane & Charnock, 2007). In Europe, the prevalence is estimated at 23% (Bauchau & Durham, 2004), while in Delhi, India, 11.03% of the population, excluding those with asthma, suffer from AR (Gaur et al., 2006). Although AR is not life-threatening, its symptoms can be distressing and have a detrimental impact on employment, quality of life, and societal well-being

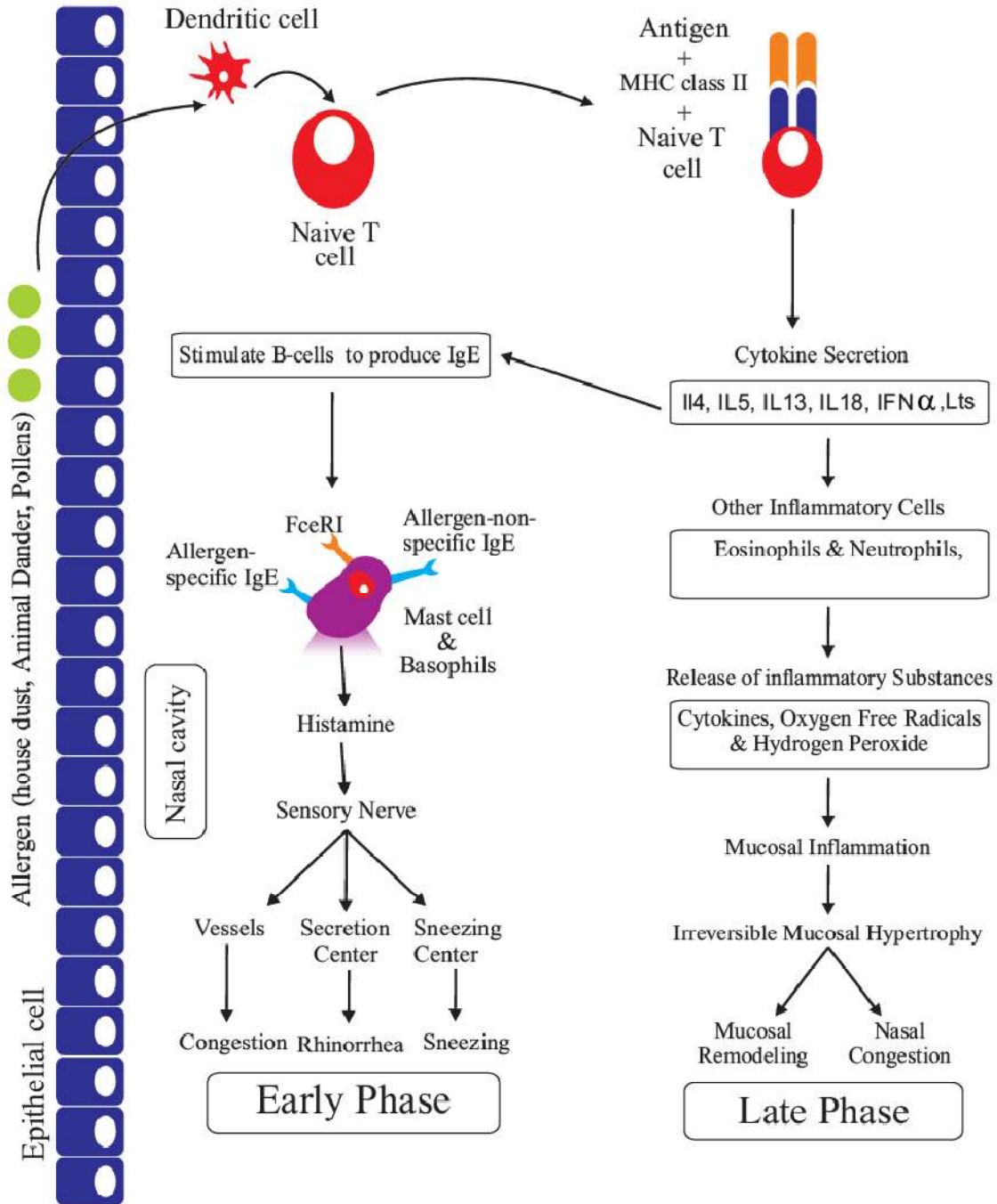
(Schatz, 2007; Gueron et al., 2007). In the United States, the direct medical costs associated with AR are estimated to be approximately \$3.4 billion (Meltzer & Bukstein, 2011).

The association of Allergic Rhinitis (AR) with asthma significantly increases its financial impact (Nathan, 2007). AR is highly prevalent and adversely affects quality of life due to its symptoms and related conditions. There is a well-documented association between AR and comorbidities such as asthma (Dara, 2017), rhinosinusitis, and atopic dermatitis (Tan & Corren, 2011). Research has shown that AR can lead to an average of 3.6 days of absenteeism annually and 2.3 hours of reduced productivity per workday due to symptoms (Lamb et al., 2006). The condition not only causes physical distress but also mental complications. In children, AR negatively impacts quality of life, sleep, school performance, and can progress to asthma, thus imposing a significant burden (Meltzer et al., 2009). Immunological inflammation in AR, which involves neural pathways, may affect psychological health, and conversely, psychological factors may influence immunological responses (Mandhane, Shah, & Thennati, 2011). Research in psychoneuroimmunology and medical genetics suggests that the central nervous system (CNS) might be affected by biochemical changes due to allergic reactions (Cheema et al., 2013). The pharmacological management of AR typically includes oral or intranasal H1-antihistamines, intranasal corticosteroids, and leukotriene receptor antagonists, used singly or in combination (Brożek et al., 2017a). Immunotherapy has also been shown to significantly reduce symptom scores and the need for medications (Mueller, 2013).

### **1.3 PATHOPHYSIOLOGY OF AR**

Allergic rhinitis is a condition that manifests when allergens such as molds, dust, pollens, and animal dander come into contact with the nasal passages, as well as the ears, sinuses, and throat. Indoor allergens like pet dander and dust mites may be present year-round, while others, such as

ragweed, are seasonal, commonly occurring in the fall (Min, 2010). Allergen sensitization begins when these substances contact the nasal mucosa and involves the following steps: The early phase response in allergic rhinitis occurs shortly after allergen exposure, where mast cells release mediators due to the cross-linking of adjacent immunoglobulin E molecules on their surfaces. This sequence leads to an accumulation of histamine, precipitating the characteristic symptoms of rhinitis, including sneezing, itching, rhinorrhea (runny nose), and congestion (Naclerio, 1997; Skoner, 2001). The late phase of the allergic response, occurring 4 to 8 hours after exposure, is characterized by symptoms such as congestion, fatigue, malaise, irritability, and potentially neurocognitive deficits (Skoner, 2001). This phase involves the infiltration of the nasal epithelium by immune cells including eosinophils, basophils, monocytes, and T-lymphocytes. These cells release a variety of mediators like leukotrienes, kinins, histamine, and others. A crucial aspect of the late-phase response is the production of cytokines (IL-4, IL-5, IL-6, IL-8, GM-CSF, and RANTES) by mast cells, TH2 lymphocytes, or epithelial cells, which is believed to play a pivotal role in mediating these symptoms (Naclerio, 1997; Skoner, 2001) (see Fig 2).



**Fig 2: Pathophysiology of AR**

#### 1.4 EFFICACY OF *YOGA* IN MANAGING ALLERGIC RHINITIS

A recent study demonstrated the efficacy of a three-month *Hatha yoga*-based intervention for patients with Allergic Rhinitis (AR). This intervention was assessed using a rhinomanometer and

spirometer to evaluate the resistance levels in the upper and lower respiratory tracts. Significant outcomes included a reduction in Nasal Airway Resistance and an increase in forced expiratory volume (FEV1) and percentage residual standard deviation (%RSD). Additionally, improved scores were observed in standard questionnaires for AR, namely the Sino-Nasal Outcome Test (SNOT) and the Short Form-12 (SF-12), indicating that *yoga* may enhance lung capacity and alleviate nasal congestion in AR patients (Chellaa et al., 2019a). Furthermore, an eight-week *yoga*-based intervention program, which included warm-up exercises, *Asanas*, *Pranayama*, Relaxation, and Meditation sessions of 60 minutes three times per week, led to a significant improvement in Peak Nasal Inspiratory Flow Rate and an increase in the secretion of interleukin (IL)-2 in the nasal discharge. These findings suggest that regular *Yoga* practice could positively affect cytokine levels, symptom scores, and nasal airflow in individuals with AR (Chanta, Klaewsongkram, Mickleborough, & Tongtako, 2019).

## **1.5 NEED FOR STUDY**

Allergic Rhinitis (AR) is a global health issue, affecting up to 40% of populations worldwide, with significant prevalence in Europe and India. Its non-life-threatening symptoms significantly disrupt daily life and work, negatively impacting quality of life and causing considerable economic burden, including in the US where AR-related medical costs reach \$3.4 billion annually. AR is also linked to comorbidities like asthma, contributing to school absenteeism and reduced productivity, and in children, it can impair sleep and academic performance, potentially leading to asthma and increasing societal impact. Given the pervasive impact of AR, there is a growing body of research exploring alternative interventions to alleviate symptoms and improve the quality of life for patients. Among these, *yoga* has emerged as a promising non-pharmacological therapy. Recent studies have shown that specific *yoga*-based interventions, such

as *Hatha yoga* and *Shuddhi Kriya*, can lead to measurable improvements in respiratory functions and nasal airflow, alongside a reduction in nasal congestion and inflammatory markers. These findings suggest that *yoga* could play a vital role in the management of AR, potentially reducing dependence on pharmacological treatments which can have various side effects. However, the existing literature is still sparse, and there is a pressing need for more comprehensive studies to validate the clinical efficacy and effectiveness of *yoga* in managing AR.