

Yoga in Allergic Respiratory Disorders : From Known to Unknown

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Abstract

Allergy and allergic disorders are increasing globally, including in India. Allergy is an immunological disorder characterized by abnormal immunological reactions to usually harmless substances. Common allergic respiratory disorders include allergic rhinosinusitis, allergic rhinoconjunctivitis, allergic bronchitis, and allergic asthma. Most allergic respiratory disorders are caused by allergy to aeroallergens and allergen avoidance is practically difficult. Except for allergen specific immunotherapy, there is no disease modifying therapy in modern medicine; most medicines aim at control of the disease and do not cure the disease.

As per modern medicine, allergic respiratory disorders involve predominantly respiratory system and immune system and it is well known that immune system is a complex physiologic system influenced by diet, environment, mind, and genetics. Due to effects of yoga on both physical and psychological domains of health, yoga has a great potential as an alternative treatment in management of allergic respiratory disorders. As a complementary treatment, yoga-based interventions can improve symptoms, decrease requirement of medications, and improve quality of life. Therapeutic effects of yoga and yoga-based interventions in allergic respiratory disorders have been shown in multiple scientific studies, however, mechanisms underlying their beneficial effects are not completely known.

The present literary research paper discusses pathophysiology of allergic respiratory disorders in brief. Yoga-based therapeutic interventions for allergic respiratory disorders are discussed as per scientific evidence. Possible mechanisms, both known and unknown, of therapeutic effects of yoga are discussed from perspectives of modern medicine, psychoneuroimmunology, and yogic sciences.

Introduction

Allergy and allergic disorders have shown steep rise in prevalence globally over last century [1]. Allergy is an abnormality of human immune system, which adversely affects other physiologic systems or organs such as respiratory system, digestive system, integumentary system, eyes, etc. Epidemiologically, allergic respiratory disorders are the most common allergic disorders.

In modern medicine, allergen avoidance is the most important part of management of allergies. Although many safe drugs are available for treatment of allergic disorders, most of them aim at control of symptoms and prevention of exacerbations of the disorder but do not improve the basic immunological abnormality underlying allergy. Allergen specific immunotherapy, the only treatment in modern medicine that has shown to

modify natural course of the allergic disease, has its own limitations.

Yoga has a great potential in management of allergic respiratory disorders. Beneficial effects of yoga-based interventions in allergic respiratory disorders have been shown in multiple scientific studies, however, mechanisms underlying such effects are not completely known. In present literary research paper, pathophysiology of allergic respiratory disorders discussed briefly and role of yoga-based therapeutic interventions for allergic respiratory disorders is discussed perspectives of modern medicine, psychoneuroimmunology, and yogic sciences.

Pathophysiology of Allergic Respiratory Disorders

Allergy is defined as a hypersensitivity reaction that is initiated by immunological mechanisms towards substances that are usually harmless to most individuals. Common allergic respiratory disorders include allergic rhinosinusitis, allergic rhinoconjunctivitis, allergic bronchitis, and allergic asthma.

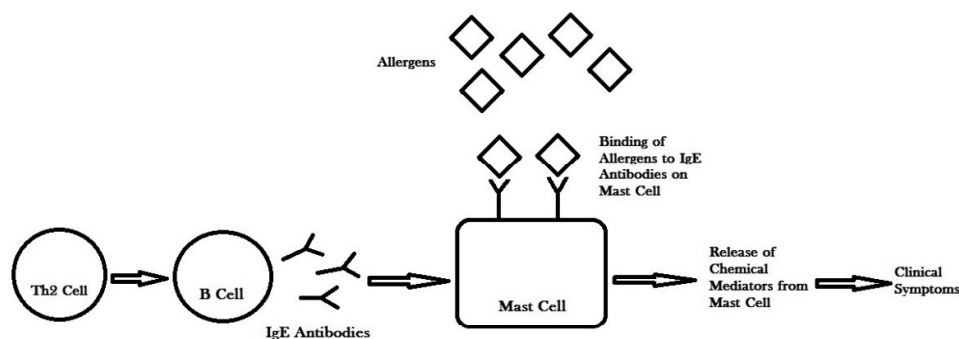
Substances that produce allergic reactions are known as allergens and are classified into aero-allergens, food allergens, and contact allergens. Allergic respiratory disorders are mostly caused by allergy to

aeroallergens; food allergens play a role in some patients, especially in children. Common aeroallergens causing allergies include house dust mites, molds, pollens, animal danders, and insect allergens.

In different allergic respiratory disorders, anatomical area/s of predominant involvement is/are different, however, the underlying immunological mechanisms are almost same. Immunologically, allergic disorders are broadly classified into “pure” IgE-mediated disorders, mixed IgE-T cell mediated disorders, and non-IgE-mediated disorders.

IgE-mediated allergic disorders are characterized by production of IgE antibodies to the allergen, while normal immune system produces IgG and IgM antibodies. Interleukins released by Th2 cells stimulate B cells to produce IgE antibodies, while normal immune system is characterized by dominance of Th1 cell responses. Simplified immunological mechanisms that underlie an allergic reaction upon exposure to allergens in sensitized person are shown in Figure 1. Important chemical mediators producing allergic inflammation and clinical symptoms include histamine, leukotrienes, heparin, proteases, various cytokines, etc. [2].

Figure 1. Simplified immunological mechanisms of pathophysiology of allergic disorders



Most allergic respiratory disorders are usually “pure” IgE-mediated disorders, i.e., symptoms develop immediately on response to exposure to aeroallergens. However, allergic asthma has a more complex pathophysiology with tendency to airway remodeling and yet unclear role of food allergens [3, 4]. Moreover, allergic rhinitis, sinusitis, and asthma share several pathophysiological mechanisms, which has been also seen epidemiologically and clinically [5]. Based on frequent simultaneous involvement of nose and sinus mucosa in allergic rhinitis, term “allergic rhinosinusitis” has been suggested. 75-80% of patients with asthma have allergic rhinitis, while up to 40% patients with allergic rhinitis can develop asthma. These findings support the concept of united allergic airway, i.e., allergic disorders affecting upper and lower airways share some common mechanisms [5]. This is also important for treatment perspective, because treatment of co-existent allergic rhinitis in asthmatic patients is important for better asthma control. Thus, a combined approach should be adopted in treatment when both conditions are present simultaneously [6].

Autonomic nervous system has a role in pathophysiology of allergic respiratory disorders. Allergic rhinitis may be

Yogic Practices in Allergic Respiratory Disorders: Role and Mechanisms

Shatkarmas: Jala neti is one of shatkarmas, which is used for cleansing and purification of nasal passages by lukewarm isotonic saline water.

Its obvious mechanism is removal of allergens, irritants, chemical mediators, and mucus from nasal passages. Its other possible mechanisms include improved drainage of paranasal sinuses, thinning of thick and sticky secretions, relieved muscular tension in facial muscles, stimulation of nerve endings in nose, and reduced anxiety and

associated with parasympathetic hyperfunction and sympathetic hypofunction [7]. In lower airways, parasympathetic nervous system controls tone of airway smooth muscles, while sympathetic nervous system controls tracheobronchial blood vessels. β -adrenergic agonists and anticholinergic drugs are used in treatment of asthma, while β -blockers are known to worsen asthma. Although these findings suggest some autonomic dysfunction in asthma patients, its exact nature is still unclear [8]. In addition to allergens, allergic respiratory disorders can also be triggered by non-allergic triggers such as smoke, strong odors, air pollution, changes in temperature, changes in humidity, cold foods, etc. Gastroesophageal reflux and obesity are known to affect asthma and chronic sinusitis adversely. Psychological stress is another important non-allergic trigger for allergic respiratory diseases. Role of stress in pathophysiology of allergic disorder can be explained on basis of psychoneuroimmunological mechanisms. Chronic psychosocial stress has shown to shift balance of Th1/Th2 immunological responses towards predominance of Th2 responses, which explain exacerbations of allergic disorders by stress [9].

depression [10, 11, 12]. Improved airflow in upper airways helps to improve overall physiology of respiratory tract and to increase effectiveness of topical treatments in allergic rhinosinusitis.

In modern medicine, nasal saline irrigation can be considered equivalent to jala neti, which has shown to be beneficial in patients with allergic rhinitis and chronic rhinosinusitis [13]. Beneficial effects of jala neti in patients with allergic asthma can be explained on basis of united airway concept and shared pathophysiological mechanisms between allergic

rhinosinusitis and allergic asthma, but there are no studies evaluating such effects till date.

Certain precautions are necessary for practice of neti. The water should be pure, preferably boiled and cooled down to desired temperature. Cases of infections, including serious infections, have been reported with use of tap water [14]. If nasal passages are not properly dried after neti, worsening of congestion can occur. Unnecessary prolonged practice should be avoided. Neti should be avoided during active infection, presence of fever, or complete nasal blockade. Patients with bleeding from nose or structural abnormality in sinusal passages should perform neti only under expert guidance [10].

Other types of neti, especially sutra neti, may benefit patients with allergic rhinitis and chronic rhinosinusitis [10, 15], but there are no clinical studies in literature. Kunjal kriya is considered beneficial in patients with allergic respiratory disorders, but there are only a few non-randomized studies [16] evaluating its effects in patients.

Surya namaskara: Surya namaskara is a dynamic group of asanas, which is known to have multiple beneficial effects on different physiological systems in body, including stretching of most of joints and muscles, massaging and toning of internal organs, regulation of psychoneuroendocrine systems, and generation of vital energy [17, 18]. When performed with breath synchronization and awareness, it helps to improve respiratory mechanics and oxygenation as well as to reduce psychological stress.

Surya namaskara is considered beneficial for all allergic respiratory disorders [19]. Improvement in total nasal airways resistance in allergic rhinitis has been observed when surya

namaskara was part of yogic interventions [20]. In normal adults, regular practice of surya namaskara for 90 days has shown to improve lung function; increased vital capacity, maximal voluntary ventilation, and forced expiratory volume in 1 second (FEV1) have been observed [21]. In asthmatic patients, regular practice of yoga including surya namaskara has shown to improve peak flow rates, lung function, clinical outcomes, and selected biochemical parameters [22, 23]. Stress reducing and weight reducing (in obese patients) effects of surya namaskara have also been documented [24, 25], which are likely to benefit patients with allergic respiratory disorders.

Surya namaskara should not be performed in presence of fever, acute inflammation, skin rashes, boils, or during menstruation. It should not be performed by patients with certain conditions such as uncontrolled hypertension, coronary artery disease, past history of stroke, hernia, intestinal tuberculosis, etc. Patients with back pain, sciatica, slipped disc, etc should consult an expert [17]. Asthmatic patients should practice surya namaskara slowly [19].

Aasanas: Aasanas are essential components of yoga practices and should not be considered merely physical postures but postures with physiological, psychological, and subtle effects. Regular practice of various asanas helps to improve flexibility of joints and spine, to reduce stiffness in body, to improve cardiorespiratory and digestive functions, and to reduce physical and psychological stress.

Selection, sequence, and duration of asanas is depends on age, training, other medical conditions, etc. In general, combination of various asanas helps to improve drainage of

respiratory tract. Inverted aasanas facilitate clearance of airway secretions in such a way that would not be otherwise drained during our daily activities due to effects of gravity. Combination of forward bending and backward bending aasanas helps to improve overall flexibility of spine and thoracic cage and also tone muscles of respiration. Development of breath awareness during practice of aasanas is also beneficial for asthmatic patients [26]. Shavasana at the end of aasana session cannot be ignored because of importance of relaxation in patients with allergic disorders.

Different studies evaluating effects of yoga in allergic respiratory disorders have used different set of aasanas in their methodologies [20, 22, 23, 27, 28, 29, 30] and have shown improved clinical outcomes, decreased medication requirements, improved quality of life, decreased total nasal airway resistance, and improved lung functions. Thus, there may not be an “ideal” set of aasanas for a particular disorder, rather following basic principles of practising aasanas is more important.

While performing aasanas, “Sthiram sukham aasanam”, i.e., “posture which is steady and comfortable” should always be kept in mind. Balancing by appropriate counter poses is important while planning sequence. Shirshasana and sarvangasana are considered contraindications in patients with active cold [19]. Aasanas that may increase gastroesophageal reflux should be avoided in asthmatics.

Pranayama: Pranayamas are not merely breathing exercises, but aim at control, regulation, and expansion of prana – vital energy or life force in Yoga [31].

Bhastrika allows rapid and rhythmic movement of diaphragm, thus improving respiratory mechanics and

oxygenation. It also prevents accumulation of phlegm in respiratory passages. Kapalbhata is also considered beneficial by cleansing airways and strengthening muscles of respiration.

Nadi shodhana helps to remove minor blockages in airways and therefore improves airflow. It also helps to increase awareness and has calming effects on mind, thus reducing stress. Ujjayi has tranquilizing and relaxing effects on mind.

As per concepts in Ayurveda and yoga, many patients suffering from chronic rhinosinusitis and asthma have dominance of “cold” in their bodies and therefore pranayamas such as suryabhedana are considered beneficial in by increasing “heat” in the body.

In a recent study, hathayoga intervention including nadishodhana, bhastrika, kapalbhata, and bhramari pranayamas for 90 days in smokers with allergic rhinitis showed significant improvement in both total nasal airway resistance and lower airway resistance using rhinomanometry and spirometry [20]. In another study, patients with allergic rhinitis who practiced yogic practices (including nadishodhana and suryabhedana pranayamas) and dietary changes for 3 months showed “cure” in more than 80% of patients, while patients treated with levocetirizine showed high recurrence following discontinuation of the drug [27].

Interestingly, a recent study has shown possibly sympathomimetic effects of suryabhedana [32] and it is well known that β -adrenergic agonists are used in treatment of asthma. However, there are no other studies specifically evaluating “heat generating” effects of suryabhedana. In healthy individuals, practice of ujjayi has shown to improve oxygen saturation and cardiac-vagal baroreflex sensitivity [33].

While discussing role of pranayama in asthma, correction of breathing requires special mention. Dysfunctional breathing may be in form of predominant thoracic breathing, hyperventilation, thoraco-abdominal asynchrony, deep sighing, or forced expiration. Dysfunctional breathing may be seen in up to 30-60% of asthmatic patients and may lead to overestimation of asthma symptoms, decreased asthma control, decreased quality of life, and increased anxiety [34, 35]. Breathing retraining to asthma patients helps to improve biomechanical, biochemical and psychophysiological dimensions of dysfunctional breathing [36]. In yogic practices, regular practice of abdominal breathing and full yogic breathing may help asthmatic patients to correct dysfunctional breathing [31]. Pranayamas should be learned and practiced under expert guidance only. Bhastrika and kapalbhati should not be practiced by patients with hypertension, heart disease, hernia, glaucoma, retinal disorders, stroke, epilepsy, vertigo, etc and during pregnancy. Nadishodhana should not be practiced during active infection or cold. Prolonged breath holding and forceful rapid breathing techniques should be discouraged in patients with asthma and ujjayi should not be practiced when an asthma attack is anticipated[26].

Meditation: Meditation is increasingly becoming popular for its multiple physiological, psychological, and spiritual benefits. In patients with allergic respiratory disorders, it can benefit by multiple mechanisms such as stress reduction, improved cardiorespiratory function, improved breathing pattern and oxygen utilization, decreased anxiety and depression, and improved overall health [37].

Meditation has been used as part of yogic interventions in several studies that have shown benefits of yoga in allergic respiratory disorders. A recently published systematic review concluded that meditation is beneficial to improve quality of life in asthma patients [38].

It should be clear that meditation is a vast subject in yogic sciences and is important for inner development and spiritual growth, while different studies may have defined meditation variously as relaxation, concentration, contemplation, mindfulness, etc. Meditation practices should be suggested to a patient on individual basis, however, ajapa japa is recommended practice for asthmatic patients by some authorities [19].

Diet: Yoga emphasizes importance of fresh fruits, lightly cooked vegetables, and wholesome grains and sprouted pulses in diet, while avoidance of oily, processed, flavoured, and preserved foods in diet. Obviously, such diet is rich in micronutrients, anti-oxidants, and prebiotics that are important for immune system. Avoidance of specific foods such as milk products or specific cereals may benefit some patients with co-existing food allergy. In modern medicine, subject of diet in allergic respiratory disorders has many controversies and unclarities [39] and, understandably, dietary suggestions should be based on personalization rather than generalization.

Conclusion

Yoga has shown to benefit patients with allergic respiratory disorders by multiple mechanisms and different yogic practices have their own importance in holistic management of a patient. With increasing understanding of pathophysiology of allergic disorders, rationale for many yogic practices in management of allergic respiratory disorders can be explained

scientifically on basis of advances in neurology, united airway concept, and psychoneuroimmunological mechanisms. Further research in this subject is likely to

benefit many patients suffering from these chronic disorders and to make their lives better.

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