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Review Article

The Significant Role of Diet and Yoga in the Management of Bronchial Asthma: A Compressive Review

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A B S T R A C T

Background: Asthma is a major non-communicable disease characterized by lung airway inflammation and immortalized by inappropriate immune response, improved airway responsiveness, and variable airflow obstruction. It is the most common chronic disease affecting both adults and children. According to the World Health Organization, it is estimated that the disease affected 262 million people in 2019 and caused 455000 deaths globally. Over the recent decade, asthma patients have increased dramatically in numerous countries demonstrating the critical influence of environmental and dietary changes on its development.We limit our discussion in this article to the dietary and yogic approaches for managing asthma.

Scope and Approach: For this review, extensive bibliographic research was carried out, including diet and asthma", "yoga and asthma", the DASH diet, and obesity, from Google Scholar, PubMed, Science Direct, and Research Gate.

Key Findings and Conclusion: The inflammation and narrowing of the airway of the lungs can be improved by the implication of yogic practices and dietary modifications. Yogic practices like breathing techniques, meditation, pranayama, asanas, and relaxation techniques help to relax the airway and improve lung function. Moreover, dietary modifications such as the Mediterranean diet, Dash diet, and low glycaemic index diet also help to reduce the symptoms of bronchial asthma.

Keywords: Asthma, DASH diet, Mediterranean diet, Yoga, COPD, Obesity

Introduction

Asthma is a serious global health problem affecting approximately 300 million people worldwide, leading to around 1,000 deaths every day. The annual death rate due to this disease is 250,000, with most of these deaths occurring in low and middle-income countries, most of which are preventable. Asthma hinders people's work, education, and family life, particularly when a child has asthma. Asthma is becoming more prevalent in developing countries in various economic forms, and the cost of treating asthma is increasing for health service systems, communities, and individuals.[1,2]

Asthma is a chronic inflammatory respiratory disorder characterized by heightened sensitivity of the airways and reversible, periodic airway obstruction. It is associated with various types of immune cells of the distinctive and adaptive immune system along with epithelial cells and airway smooth muscle cells this leads to bronchial hyperactivity, respiratory airway narrowing and remodelling, and excessive mucus production.[3]

Classic treatments for asthma include inhaled medications and bronchodilators, allergen avoidance, and lifestyle changes.[4–6] Non-pharmacological like breathing exercises, yoga, pranayama, and inspiratory muscle training. These methods help manage asthma by relaxing the muscles of the airways and increasing airflow to the lungs.[7] Non-drug therapies for asthma management are becoming increasingly popular, especially among adults. These therapies, when used alongside medication, can effectively and rapidly control asthma.[8] Yoga is widely recognized globally for its benefits in improving the functioning of both body and mind. In recent years, many people have been attracted to yoga due to its observed mental and physical benefits. Various studies have been conducted on the effectiveness of different breathing techniques for asthma control, showing improvements in asthma patients. These improvements include a reduction in symptoms, better quality of life, less use of beta-adrenergic medication, and reduced airway hyper-reactivity.[9]

Asthma is a respiratory disease in humans that narrows the airways. It is often triggered by exposure to allergens, cold air, exercise, high levels of stress, and indoor pollution leading to difficulty in breathing. This can result in severe problems like asthma attacks.[10–13] Bronchial asthma is a serious lung condition, with symptoms including chest tightness, difficulty in breathing, and coughing, which may require the use of bronchodilators. Bronchodilators are medications that widen the airways to improve airflow, making it easier to breathe.[14] They are commonly used in the treatment of asthma, COPD, and other respiratory problems. These medications are typically administered through inhalers or nebulizers.[15] Asthma can be identified by specific indicators such as periodic reversible bronchial spasms caused by increased sensitivity of the airways to various stimuli. An asthma attack occurs in the airways, which are the paths that carry air to the lungs. These airways become narrowed due to inflammation of the bronchial walls, resulting in swelling and mucus secretion in the bronchial lining. This forces asthma patients to use accessory muscles for breathing.[16] Bronchial asthma is a distinct type of disease with various effects and scientific bases, classified into mild and severe categories based on symptoms. Many causes trigger bronchial asthma, which can be either internal or external. External causes often involve hypersensitivity to external allergens. Internal causes include various infections, changes in weather, exercise, and daily routines. Intrinsic causes of asthma can manifest in many forms such as recurrent asthma, exercise-induced asthma, drug-induced asthma, occupational asthma, and smoking-induced asthma. These symptoms can vary according to an individual's environment, stress level, mentality, and physical factors like age and weight, which can result in asthma ranging from mild to moderate.[11,17,9]

Signs and Symptoms[2,18,19]

1. Bronchial asthma is characterized by difficulty in breathing, wheezing, and coughing at night.
2. Trouble exhaling and vocal cord dysfunction
3. Feeling of stiffness or discomfort in the chest
4. Asthma attacks can last for several hours.
5. Severe attacks can affect the heart and circulatory system.
6. In bronchial asthma, carbon dioxide retention, respiratory acidosis, and oxygen deficiency are infrequent.

Objective of the study

The objective of the study is to focus on the role of non-pharmacological therapies such as yoga and diet interventions in the management of inflammatory respiratory disorders such as bronchial asthma.

Materials and Methods

The study focused on keywords such as asthma, bronchial asthma, DASH diet, yoga, COPD, obesity, pranayama, "Diet and asthma," and "Yoga and asthma." This research synthesis emphasized the identification and analysis of relevant studies that examined the improvement of asthma symptoms. Extensive bibliographic research was conducted using databases such as PubMed, Google Scholar, Science Direct, and Research Gate. Additionally, studies that assessed the importance of yoga and diet in improving symptoms of bronchial asthma were included in the review

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Inclusion and Exclusion Criteria

Inclusion Criteria

- Review articles, systematic review articles, critical reviews, and meta-analyses focusing on the role of diet and yoga in the management of bronchial asthma.
- Case studies that discuss the effects of yoga, pranayama, or dietary interventions on asthma symptoms.
- Articles emphasizing evidence-based practices for the use of dietary patterns (e.g., DASH diet) and yoga in improving bronchial asthma outcomes.
- Studies published in peer-reviewed journals.
- Articles in English language.
- Publications from the last 5 years

Exclusion Criteria

- Original research articles, clinical trials, and randomized control trials.
- Articles that do not focus on bronchial asthma or discuss general asthma without reference to diet or yoga.
- Studies focusing solely on COPD or obesity without linking these conditions to asthma management.
- Non-peer-reviewed articles, conference abstracts, opinion pieces, or editorial letters.
- Publications not available in full text or not in English language.

Article Screening and Inclusion Process

A total of 120 articles were initially identified through extensive bibliographic research using databases such as PubMed, Google Scholar, ScienceDirect, and ResearchGate. After screening the titles and abstracts for relevance, 95 articles were selected for further review. Following the application of inclusion and exclusion criteria, 75 articles were included in the final review.

The selection process involved

- **Initial Identification*:*** 120 articles identified based on keywords such as asthma, bronchial asthma, DASH diet, yoga, COPD, obesity, pranayama, "Diet and asthma," and "Yoga and asthma."
- **Screening*:*** 25 articles excluded due to irrelevance or duplication.
- **Eligibility Assessment:** 20 articles excluded after full-text evaluation for not meeting the inclusion criteria (e.g., original research papers or insufficient focus on the role of diet and yoga in asthma).
- **Final Inclusion*:*** 75 articles were included, comprising review articles, systematic reviews, critical reviews, meta-analyses, and case studies.

Pathophysiology of Bronchial Asthma

Bronchial asthma causes the respiratory pathways (airways) to narrow and the bronchia to spasm, a condition known as bronchospasm. In this condition, there is a sudden tightening of the muscles lining the airways of the lungs, which narrows the airways and makes breathing difficult.[20] This process includes:

- Release of histamine: Histamine is a chemical found in body cells that causes allergy symptoms like a runny nose and sneezing.
- Bronchial spasms and swelling of the bronchial lining
- Increased bronchial secretions
- Trapped gases in the alveoli and reduced ventilation
- Coughing, shortness of breath, wheezing.[9]

When allergens are inhaled, they quickly interact with mast cells in the mucosal tissue, leading to an increase in histamine and cysteinyl leukotrienes, which cause bronchospasm (spasms in the respiratory tract). Airflow is controlled by the constriction of the airways, which is due to irritation in the bronchial walls. This irritation causes the bronchi to swell and secrete mucus. When breathing becomes difficult, asthmatic patients use accessory muscles to assist with respiration, making the process even more challenging.[9,21]

Irritated airways react to environmental allergens like dust and smoke, causing problems with air entering and exiting the lungs. In patients with bronchial asthma, the airways become hypersensitive and narrow when irritated, leading to difficulties in respiration.[9]

The primary medications used for asthma treatment include:

- **Long-acting β2 agonists**: These helps relax the muscles around the airways.[22]
- **Inhaled corticosteroids**: These reduce inflammation in the airways.[23]
- **Oral steroids**: These are used for severe asthma to reduce inflammation.[24]
- **Leukotriene modifiers**: These helps prevent the action of leukotrienes, which cause airway inflammation.[25]
- **IgE Blockers**: These prevent the immune system from reacting to allergens that can trigger asthma symptoms.[26]

The worsening of asthma leads to emergency scares and unnecessary hospital admissions, increasing the costs associated with asthma care.

Several contributing factors to asthma include:[27,28]

- **Natural Environment**: Environmental factors such as pollution, dust, smoke, and chemical fumes.
- **Socio-economic Status**: Poverty, lack of education, and inadequate healthcare services.
- **Psychological State**: Stress, anxiety, and depression.
- **Cultural Norms and Practices**: Cultural practices and norms such as smoking in the house or reliance on natural remedies can increase the risk of asthma.

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Environmental factors significantly impact underdeveloped countries, with risk factors including exposure to allergens, irritants, industrial pollutants, and particulate matter. Common harmful gases that lead to asthma include ozone (O_3), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2)[29] Figure 1.

Role of Yoga in The Management of Bronchial Asthma

Yoga practice is an ancient discipline from India and is considered the world's oldest science of personal and spiritual expansion. Yoga originated in ancient India and became an integral part of India's unity and diverse culture.[42] It is a practice of the mind, body, and spirit. Yoga practices involve postures, breathing techniques, and meditation, which relate to the physical body and have an impact on the mind and spirit.[43] Yoga is the science of living correctly, addressing all aspects of a person: physical, mental, emotional, and spiritual. The practice of yoga fills the body with cosmic energy.[44]

Yoga promotes self-healing by reducing negativity and eliminating toxins from the body, leading to increased energy, positivity, self-awareness, focus, and concentration.[45] The statement that bronchial asthma can be treated through yoga has been documented. Among non-pharmacological therapies, yoga includes breathing techniques, such as alternate nostril breathing exercises. These techniques regulate the prana (life force) in the body, reduce stress, and improve the condition of the patient. Breathing exercises are the most convenient and fall under non-pharmacological management for asthma. Practicing breathing exercises can improve asthma symptoms, and combining these exercises with medical care can bring about significant improvement in symptoms.[46]

Regular practice of yoga and pranayama can help control asthma, manage stress, reduce anxiety, and improve the quality of life affected by asthma. Breathing exercises beneficial for asthma management can be practiced regularly at home, leading to better control over asthma. Yoga can be used as a complementary therapy to alleviate asthma, but many people may find it challenging to practice yoga. Asthma is a type of chronic respiratory disease involving various cells and cellular elements. Its severity can be acute or chronic, leading to airway obstruction and inflammation in both conditions.[47] The main symptoms are caused by mediators released by active mast cells, eosinophils, and T-lymphocytes.[48]

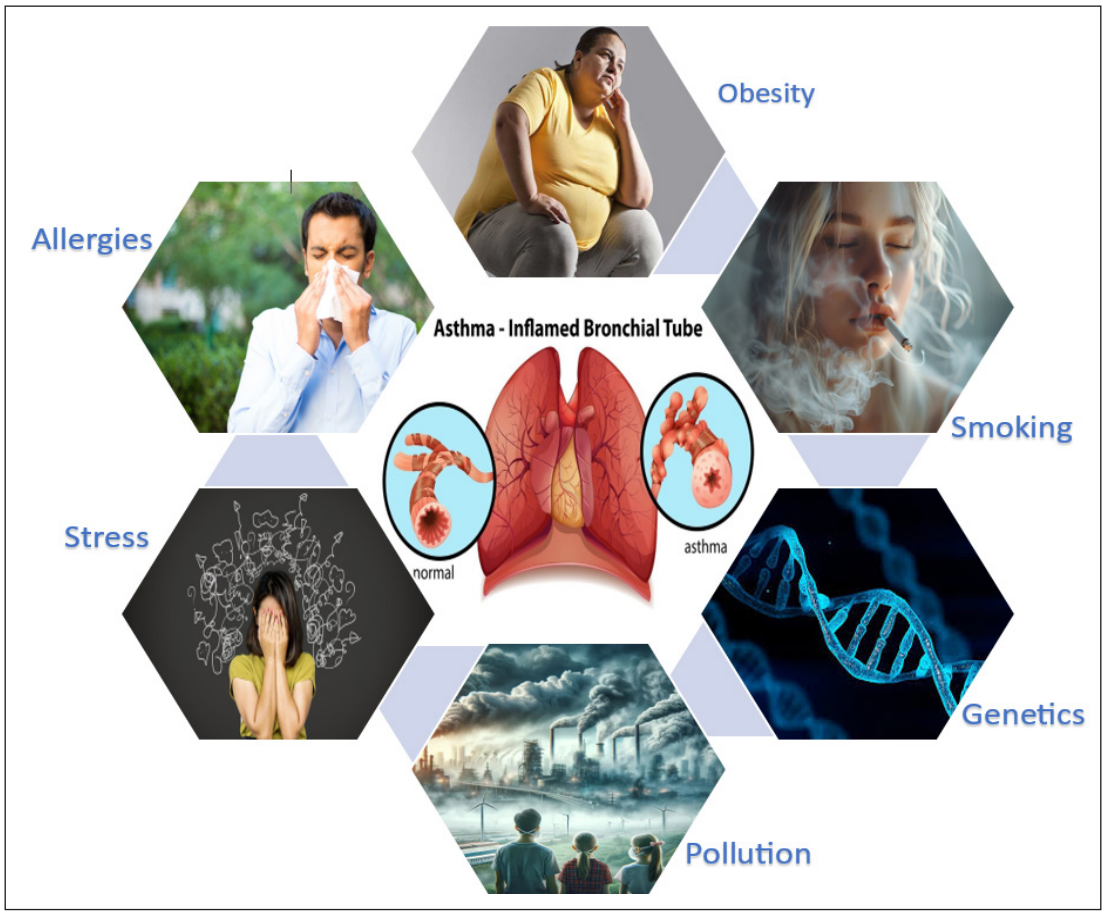

Figure 1.Causes of Bronchial Asthma[31–42]

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Yoga, pranayama, meditation, Shuddha kriyas, and relaxation are the key factors that are helpful in managing bronchial asthma without any extreme burden of paying the bills for the hospital medication. It's a very simple and manageable practice that can be done very easily.[49]

The main asanas, pranayama, meditation, etc., found by compiling the yoga protocols mentioned in different papers used to create this systematic review are as follows:

Pranayama: Pranayama is a Sanskrit word that means control over the breath. (Beyutko breathing) The main pranayamas included under pranayama are Nadi Shodhana (Anulom Vilom), and Bhastrika. The shuddha kriyas include Kunjal, Jala Neti, and Kapalabhati.[50,51] Breathing is of great importance for maintaining the quality of life and good health, which is why practicing pranayama can be very beneficial. In cases of bronchial asthma which is a respiratory disease, pranayama has shown significant benefits. Pranayama controls and directs energy, which helps in properly regulating the breath. Pranayama establishes a connection between emotional processes, cognitive processes, and behavioural processes.[52] Many studies have found that pranayama regulates physical and mental health, strengthening relationships, which helps in treating anxiety and depression.[53] Asthma is a disease that often gives rise to anxiety and depression as well, in which pranayama shows a positive impact.[54]

Asanas: The main asanas include Bhujangasana, Tadasana, Gomukhasana, Sarvangasana, and Ustrasana.[51,55,56]All types of easy chest postures help relax strained muscles and correct obstructions in the airways, allowing air to enter the airways properly and making both passive and active breathing possible. Backward postures help in expelling accumulated mucus from the lungs out of the body.[54,57] Yoga asanas are an aerobic component that possibly stimulates the central nervous system to release endorphins, monoamines, and brain-derived neurotrophic factors in the hippocampus.[38]

Relaxation: Under relaxation, meditation, Shavasana, and Om chanting were included.[54] Relaxation might play a vital part in the management of respiratory diseases like bronchial asthma. Yoga establishes control over the autonomous nervous system, creating a connection between the parasympathetic and sympathetic nervous systems. This reduces stress impulses, helping to calm the mind.[56] Additionally, it clears negativity, leading to a decrease in emotions and thoughts in the mind.[38]

It is suggested that the total time duration for performing almost all the yoga protocols should be between 30 minutes to 45 minutes.[51,56,57]

Dietary Recommendation During Asthma

The choices we make in our daily lives have a pivotal role in our health, particularly in our dietary habits. Obesity and overweight are some of the most important factors that contribute to the onset of asthma.[58] In recent studies it has been hypothesised that decreasing the sources of antioxidant such as fruits and vegetables (lycopene present in tomato), and n-3 PUFA sources such as fish oil, and increasing n6-polyunsaturated fatty acids such as margarine and vegetable oil contribute to the increased level of asthma.[59] 1994, it was meant that asthma was the outcome of the air we breathe that is becoming increasingly toxic, but after a while, it has been noted that one of the consequences of asthma and atopy diseases is changes in diet.[59]

Inflammation in the airway is a significant constituent of asthma which is modulated by dietary changes. It has been noticed that following a pattern of the Western diet is a problematic factor in dealing with asthma. According to a study, a high intake of high-fat mixed meal increases sputum neutrophils 4 h post meal in patients with asthma. Moreover, the Western diet also activated several genes in sputum that are involved in immune system processes such as TLR4 responsible for airway inflammation. Meanwhile, a reduction in the intake of saturated fats and an increase in the intake of vegetables and fruits in the diet are associated with a reduction in the incidence of neutrophilic airway inflammation and a decrease in pro-inflammatory cytokines in plasma. Moreover, a lower intake of fibre and antioxidants are associated with increased eosinophilic airway inflammation.[60]

Commonly, the Mediterranean diet, low glycaemic index diet, and Dash diet are recommended for asthmatic patients. These diets are responsible for reducing the level of C-reactive protein (CRP), interleukin-6 (IL-6), and tumour necrosis factor-alpha (TNF-α).[61,62] Several studies show a positive impact of a low glycaemic index diet on inflammation in obese adolescents suffering from asthma.[63,64]

The healthy human gut and balanced immune system are directly associated with a reduction in the prevalence of asthma. Diet plays a significant role in the balance of the gut microbiome. Dietary patterns such as unprocessed food, and the Western diet have bad effects on intestinal microbiota and immune response, explaining the increase in non-communicable diseases such as diabetes, asthma, hypertension, cancer, obesity, and neurological disorders. Moreover, unprocessed foods containing no or little dietary fibre strongly alter gut health, resulting in a condition called dysbiosis. It is a condition in which healthy bacteria get

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reduced and pathogenic bacteria increase.[62] Nevertheless, the consumption of probiotics and an antioxidant-rich diet improves the interplay between gut, health, and immunity.[65,66]

Guidelines Recommendations for Asthma[37,59–61,67–74]

1. Increase the consumption of vegetables and fruits as it reduces oxidative stress.
2. Include omega-3 polyunsaturated fatty acid sources in the diet such as cod liver oil.
3. Avoid saturated oil and trans fats while including unsaturated oils.
4. Reduce sugar consumption as it contributes to weight reduction because of reducing the incidence of both allergic asthma and non-allergic asthma.
5. Increase fibre intake in the diet that is responsible for the production of short-chain fatty acids (SFCA) such as butyrate, propionate, and acetate.
6. Diet must include antioxidants and polyphenols that serve as barriers to protect against inflammation.
7. Avoid red meat as it leads to inflammation while increasing the consumption of oily fish such as tuna, herring, mackerel, trout, and salmon as it rich in EPA, PUFA, and DHA.
8. The concept of "asthma nutrigenomics" can also be recommended where the genetic data guide dietary recommendations are followed to enhance the prevention of personalized episodes of asthma.
9. A diet should include a source of Vitamin C such as lemon, orange, pepper, tomato, spinach, broccoli, etc.
10. A diet should include a source of Vitamin A such as Milk, eggs, orange-yellow fruits, and vegetables.
11. A diet should include a source of Vitamin E such as vegetable oil, seeds, nuts, green vegetables, etc as it helps in membrane stabilization and inhibiting Ig E production.
12. A diet should be rich in flavonoid sources such as cabbage, salad, tomato, grapes, apples, etc.
13. A diet should contain the sources of trance mineral selenium such as nuts and seeds, seafood, etc. as it is an important antioxidant and a co-factor for glutathione peroxidase that plays a key role in protecting cells against oxidative damage and preventing lipid peroxidation by reducing hydrogen peroxide and organic peroxide.
14. The DASH diet also shows positive results in the improvement of symptoms of asthma. A high intake of fruits and vegetables, fish, whole grains, low-fat dairy products, decreased amount of sodium, cholesterol, and red meat is associated with a decreased incidence of COPD and hence, responsible for reducing the incidence of secondary outcomes of COPD i.e., asthma.
15. The Mediterranean diet, characterized by high consumption of fruits, vegetables, fruits, whole grains, and fish is beneficial in the treatment of asthma while avoiding the Western diet including processed foods.

Conclusion

Asthma is a chronic inflammatory respiratory disease characterized by difficulty in breathing, wheezing, and coughing at night. According to the World Health Organization, there are many causes of asthma such as premature birth and allergies like eczema, exposure to tobacco and smoke, outdoor and indoor pollution, obesity, etc. Asthma cannot be cured but it can be managed by therapies such as pharmacological as well as nonpharmacological. These therapies include the use of an inhaler, bronchodilators such as salbutamol, and steroids such as beclomethasone. In the contemporary world, it is important to raise community awareness about non-pharmacological therapies and the importance of diet in the management of asthma.

Conflict of Interest: None

Source of Finding: None

Authors' Contribution: MD: Led the conceptualization of the article and conducted an extensive review of the role of yoga in managing bronchial asthma. She authored the initial draft and integrated key findings into the manuscript. PB: Corresponding author, contributed the section on diet and nutrition, offering a detailed analysis of dietary recommendations and their impact on asthma management. She also reviewed and finalized the manuscript for submission. ACK: Provided critical input on the methodology and guidelines for the review, ensuring the inclusion of evidence-based practices in yoga and diet for asthma management. PSB: Contributed to the manuscript's review and correction, ensuring the content met academic and scientific standards.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process: None

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