Bronchial asthma is characterized by hyperresponsiveness of tracheobronchial smooth muscle to a variety of stimuli, resulting in narrowing of air tubes, often accompanied by increased secretion, mucosal edema & mucus plugging. Asthma is increasing in prevalence world wide and is around 200 million, with a mortality of around 0.2 million per year. The estimated burden of asthma in India is more than 15 million. The etiology of bronchial asthma includes viral infections, season, food, aeroallergens, irritants, air pollution etc. Pathophysiology of asthma includes inflammation of the pulmonary airways and bronchial hyperresponsiveness that results in the clinical expression of a lower airway obstruction that usually is reversible. The treatment of asthma mainly involves allopatic drugs like sympathomimetics, methylxanthines, anticholinergics, mast cell stabilizers and corticosteroids. Along with the therapeutic effects, the above drugs, also produce many side effects. The herbal drugs are considered to be safer compared to the conventional treatment of asthma. This article provides an insight about asthma, conventional drugs used for the treatment and herbs used to treat asthma with their possible mechanism of action.

Keywords: Asthma, herbal drugs, bronchodilation.

**INTRODUCTION**

Respiratory disorders, in particular, asthma is increasing in prevalence, and is a global phenomenon. Even though genetic predisposition is one of the factors in children for the increased prevalence, urbanization, air pollution and environmental tobacco smoke contribute more significantly. It is a disease, causing significant morbidity and mortality and is a serious health problem causing increase in health care cost, decrease in productivity and death. “Bronchial asthma is characterized by hyperresponsiveness of tracheo-bronchial smooth muscle to a variety of stimuli, resulting in narrowing of air tubes, often accompanied by increased secretion, mucosal edema and mucus plugging”.

Epidemiology:

- The prevalence of asthma world wide is around 200 million with a mortality of around 0.2 million per year.
- The estimated burden of asthma in India is more than 15 million.
- Hospital based study on 20,000 children under the age of 18 years from 1979, 1984, 1989, 1994 and 1999 in the city of Bangalore showed a prevalence of 9%, 10.5%, 18.5%, 24.5%, and 29.5% respectively.
- In the United States the number of asthmatics has leapt by over 60% since the early 1980s and deaths have doubled to 5,000 a year. [Source: WHO fact sheet N/206].
- On an average 1,500 people die from asthma each year in the UK. This equates to four people per day, or one person every six hour. [Source: The National Asthma campaign website].
- In Australia, one child in six under the age of 16 is affected. [Source: WHO fact sheet N/206].
- A study was undertaken in 12 schools on 5570 children [urban] and 990 rural school children in the age group of 6-15 years. The urban/rural data were correlated as also the location of schools in relation to Traffic and socio-economic groups (affluency) to which children belonged and the results are as follows: [Table:1]

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of children</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>School in heavy traffic region and children from affluent families.</td>
<td>3722</td>
</tr>
<tr>
<td>Group II</td>
<td>School in heavy traffic with children of low socioeconomic groups (less affluent).</td>
<td>273</td>
</tr>
<tr>
<td>Group III</td>
<td>School in low traffic region, children from affluent Family groups.</td>
<td>2565</td>
</tr>
</tbody>
</table>

- Asthma may have its onset at any age; 26.3% of patients are symptomatic by one year of age, one to five years 51.4%, over five years 22.3%. It was observed that in 77.7% the asthma begins in children of less than 5 years.

**Etiology:**

The etiology of bronchial asthma is multifactorial i.e., genetic, developmental, environmental, inflammatory and immunological. Triggering factors include:

- **Viral infections:** Clinical evaluation revealed that in 40% of children the precipitating factor for an asthma attack was viral upper respiratory tract infection.
- **Season:** Seasonal variation of asthma attacks has been experienced by 35% of children, which is as follows; during monsoon – 75.8%, winter – 82.3%, and summer – 2.8%.
- **Food:** The role of food allergy in asthma is historically a controversial subject and difficult to prove in children in particular. It is noticed by survey purely history based that 19.75% of children seems to suffer with food related asthma according to parents. The most blamed offenders are as such, grapes (57%), banana (53%), guavas (51%), citrus fruits (28%), ice cream (21.5%), fried foods (19%), tomatoes (12.5%) and other food items suspected are less common.
- **Aeroallergens:** Studies have shown that children develop sensitivity to indoor allergens as they grow older in that atmosphere. Studies have also shown that sensitivity of

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1.5% at 1 year increases to 90% at 8-11 years of age. The predominant indoor allergen is “the house dust mite”.

- **Irritants**: Smoke, sprays, burning of mosquito coils, cooking smell are the triggering factors in 6% of children. Observation has shown that cigarette smoke as an irritant, triggers asthma and has increased from 6% in 1994 to 7.5% in 1999.
- **Pets**: Among the pets like dogs, cats and birds are mainly responsible i.e., 89%, 38% and 11% respectively.
- **Air pollution**: Both outdoor and indoor pollutants are responsible. The important outdoor pollutants are; black smoke, suspended particulate (T.S.P), sulphur dioxide, nitrogen oxides, carbon monoxide, ozone and lead produced by combustion of fossil fuels, factories, mines, paper pulp mills, automobile exhaust etc.
- **Exercise**: A few minutes after the cessation of exercise, there is narrowing of airways which can be proved by decreased forced expiratory flow rate at one second.

**Pathophysiology:**

Asthma is best described as a chronic disease that involves inflammation of the pulmonary airways and bronchial hyperresponsiveness that results in the clinical expression of a lower airway obstruction that usually is reversible. Physiologically, bronchial hyperresponsiveness is documented by decreased bronchial airflow after bronchoprovocation with histamine.

Bronchial provocation with allergens induces a prompt early phase Immunoglobulin E (IgE) mediated decrease in bronchial airflow followed in many patients by a late phase IgE mediated reaction with a decrease in bronchial airflow for 4-8 hours.

The gross pathology of asthmatic airways displays lung hyperinflation, smooth muscle hypertrophy, lamina reticularis thickening, mucosal edema, epithelial cell, sloughing, cilia cell disruption and mucous gland hypersecretion. Microscopically asthma is characterized by the presence of increased numbers of eosinophils, neutrophils, lymphocytes and plasma cells in the bronchial tissues, bronchial secretions and mucous. Initially there is recruitment of leucocytes from the bloodstream to the airway by activated CD4 T-lymphocytes. The activated T-lymphocytes also direct the release of inflammatory mediators from eosinophils, mast cells and lymphocytes. In addition the subclass 2 helper T-lymphocytes produces Interleukin-4 (IL-4), IL-5 and IL-13. IL-4 in conjunction with IL-13 signals the switch from IgM to IgE antibodies. The cross linkage of two IgE molecules by allergen causes mast cells to degranulate, releasing histamine, leukotrienes and other mediators that perpetuate the airway inflammation. IL-5 activates the recruitment and activation of eosinophils. The activated mast cells and eosinophils also generate their cytokines that help to perpetuate the inflammation. Regardless of the triggers of asthma, the repeated cycles of inflammation in the lungs with injury to the pulmonary tissues followed by repair may produce long term structural changes (remodeling) of the airways.

**Types:**

Clinically bronchial asthma is classified as:

- **Mild intermittent asthma**: The patient gets discrete, infrequent, acute attacks, which are relieved by bronchodilator drugs with no disability between the attacks. In these cases, there is often a recognizable precipitating factor such as allergy, an upper respiratory tract infection or psychological trauma.

- **Chronic persistent asthma**: This is generally due to the presence of inflammation and thickening of mucosa of the bronchioles with resultant excessive secretion of mucous decreased elastic recoil of the lung tissue and destructive changes in the alveolar walls. This leads to hyperreactivity of the bronchi and bronchospasm.

**Severe acute asthma [Status asthmaticus]**: This is a condition where an acute attack is severe, persistent does not respond to routine treatment with β-adrenergic stimulants and is accompanied by evidence of respiratory insufficiency or failure.

**Exercise-induced asthma**: In which the attack is precipitated by exercise or following inhalation of cold air.

**Treatment:**

Drugs used are:


Methylxanthines - Theophylline, Aminophylline.

Anticholinergics- Atropine methonitrate, Ipratropium bromide, Tiotropium bromide.

2. **I Mast cell stabilizers**: Sodium cromoglycate, Nedocromil, Ketotifen.


Apart from therapeutic actions, the common side/adverse effects shown by above drugs are as shown in table no.2:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Drug</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Isoprenaline</td>
<td>Tachycardia.</td>
</tr>
<tr>
<td>2.</td>
<td>Salbutamol</td>
<td>Muscle tremors (dose related), palpitation, restlessness, nervousness, throat irritation and ankle edema.</td>
</tr>
<tr>
<td>3.</td>
<td>Theophylline</td>
<td>Convulsions, shock, arrhythmias, increased muscle tone, flashes of light seen, tachycardia, flushing, hypotension, restlessness, tremors, vomiting, palpitation, diuresis, dyspepsia, insomnia etc.</td>
</tr>
<tr>
<td>4.</td>
<td>Anticholinergics</td>
<td>Dry mouth, difficulty in swallowing and talking, scarlet rash, photophobia, blurring of near vision, palpitation, ataxia, delirium, hallucinations, hypotension, weakness and rapid pulse, cardiovascular collapse with respiratory depression, convulsions and coma [in severe poisoning].</td>
</tr>
<tr>
<td>5.</td>
<td>Sodium cromoglycate</td>
<td>Bronchospasm, throat irritation and cough in some patients; especially with fine powder inhalation, dizziness, arthralgia, rashes and dysuria.</td>
</tr>
<tr>
<td>6.</td>
<td>Ketotifen</td>
<td>Sedation, dizziness, dry mouth, nausea and weight gain.</td>
</tr>
<tr>
<td>7.</td>
<td>Corticosteroids</td>
<td>Cushing’s habitus, fragile skin, purple striae, hyperglycemia, muscular weakness, susceptibility to infection, delayed healing of wounds and surgical incisions, peptic ulceration, osteoporosis, glaucoma, growth retardation, psychiatric disturbances, suppression of hypothalamo-pituitary-adrenal (HPA) axis etc.</td>
</tr>
</tbody>
</table>
Even though the synthetic drugs are used for the treatment of asthma, they are associated with the above side/adverse effects and hence the herbal treatment for asthma can be extremely effective depending on the severity of the asthma, and they can reduce or eliminate the side/adverse effects.
nate the need for the synthetic drugs and inhalers. They can also be safely used to complement conventional treatment of asthma. Herbal medicines can bring significant relief to sufferers of asthma without the side effects or other complications that often accompany conventional drugs. Following are the herbal drugs reported to have anti-asthmatic effect with their possible mechanism of action:

**Conclusion:**
Asthma is a disease associated with respiratory system and is increasing in prevalence. Treatment of asthma is mostly with conventional allopathic drugs, which irrespective of being therapeutically useful, produce side/adverse effects. Extensive research work is going on in the use of herbal drugs for the treatment of asthma. Herbal drugs are found to be more safe and therefore can be used as alternate and/or adjunctive drugs for the treatment of asthma.

**References:**

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