1.1. Introduction

According to World Health Organization (WHO), about seventy five percentage of the people believes on herbs as traditional remedies for their health related problems. The plants are being provided us medicines to cure various diseases apart from food and shelter since ancient times. Herbal medicines are developed in various civilizations and are named differently as in India (Ayurveda), in China (Chinese), Kampo in Japan and Unani- Tibb in South Asia (Dinesh kumar, 2012).

In prehistoric times people were aware about therapeutic and toxic effect of plants, minerals and other substances. Current archaeo-botanical excavations tell us about the evidence of the medicinal plants use in the Ayurveda. In India, diverse culture and civilization existed on the various basis such as religion, language and culture. Therefore, diverse medicinal systems have been developed in India (Sen and Chakraborty, 2017).

In India, more than 4000 terrestrial plants have already been studied for their biological activities and 20% of them have been already proven for their significant biological activities. In India, approximately 70% of allopathic drugs are discovered from natural sources and they are then manufactured synthetically because of scarcity of some natural drugs and their various analogues have been prepared. It is observed that 60% of cancer drugs used now a day or under clinical trials are obtained from natural products. More than 70% entities among 177 anticancer drugs approved are prototype of natural drugs. Globally about 25% prescription drugs found are discovered from medicinal plants, and about 121 such drugs modifies are in use. During 2005 to 2007, united states have approved thirteen drugs from natural sources and more than 100 such drugs are in pipe line of clinical trials. It is reported that essential medicine list of WHO contains 11% out of 252 drugs found are discovered from plant based origin. In India almost all the traditional medicine practitioners utilizes plant based drugs. It is mentioned that about 1200-1800 plants are used by Ayurveda, Siddha medicine utilizes 500-900 plants, Unani includes 400-700 plants and about 300 medicinal plants uses by Amchi medicine whereas traditional healers of India utilizes 7500 plants in
various systems of medicine. About 526, 573 and 902 plants are mentioned in Sushruta Samhita, Charaka Samhita and Astanga Hridaya (Sen and Chakraborthy, 2017; Jaiswal, 2016). Thus, various historical evidence suggested the great knowledge of substances originated from natural origin by our ancestors that established the various systems of medicine worldwide. These traditional medicines are really protected human beings since antiquity and are still giving us many leads out of research and development and medications (Dhami, 2013). Therefore natural originated drugs are needed to be explored more to get new leads so that it can be converted into new drugs.

1.2. Asthma

According to WHO, asthma is a major health problem. It is characterized by cough, chest tightness, wheeze, and dyspnea due to chronic airway inflammation and increase in hyper-responsiveness (Partibhan, 2014).

In India about 15 Million patients are reported to be suffered from asthma. One of the surveys of more than 2000 individuals, asthma prevalence was found 2.0% in women, 3.65% in men and children having 11.9%. Boys have more suffered from asthma when compared with girls (12.8% and 10.7%, respectively). According to ISAAC report children have asthma prevalence at age of 6-7 and 13-14 year old in India. These report suggested the patients of asthma in Indian are children.

In America around 16 to 17 million peoples have asthma and the figure is increasing day by day since 1980. In United States it is reported that 9 million children below age 18 may have asthma. The asthmatic lungs undergo changes and their airways get hyper-reactive to different allergen which is not happened in healthy lungs. Asthma attack causes the spasm in bronchial tissues and due to this cells get inflamed and mucus is secreted. Thus causes bronchoconstriction and asthmatic person has difficulty to breathe. Mast cells, release histamine and leukotrienes, cause the bronchial muscle contraction and thereby stimulate the formation of mucus. Most of the asthmatic patients are prone to react with allergens but they are not aware that such allergens like pollens, dust are exaggerating their attacks. Apart from these, asthma
could be caused to many patients who are not allergic (Bosquet and Khaltaev, 2007).

1.3. Epidemiology of asthma

It is a chronic breathing disorder in which breathlessness and wheezing are common symptoms. The causes of asthma are common to some of the asthma persons. There are some inhaled allergens are given below which triggers the asthmatic attacks

- Indoor allergens (e.g. house dust, mites and pollution)
- Outdoor allergens (for example pollens and moulds)
- Tobacco smoke and
- Chemical substances

Sometimes cold air, anger, fear and some medicines like aspirin and beta blockers may trigger asthma. WHO estimated, globally 235 million people are asthmatic (Teotia, 2014). The various stages of asthma are given below on the basis of its severity of symptoms

1. **Mild**
Mild dyspnea, diffuse wheezes and adequate air exchange.

2. **Moderate**
Respiratory distress at rest, marked wheezes and involvement of accessory muscles

3. **Severe**
Marked respiratory distress, cyanosis, use of accessory muscles, marked wheezes

4. **Respiratory failure**
Severe respiratory distress, lethargy, confusion and use of accessory muscles.

1.4. Pathophysiology of asthma

The airflow is recurrent in asthma and undergoes various changes are described below

- **Bronchoconstriction**
In asthma, the major physiological change is airway narrowing, which causes interference with airflow. In acute asthma, exposure to some allergens causes bronchoconstriction and release of mast cells (histamine, leukotrienes, and prostaglandines) which causes contraction of smooth muscles of airway. This is IgE dependent response. Some medicines like Aspirin and NSAID drugs causes contraction of airway smooth muscles and this is non-IgE dependent response.

- **Airway edema**
  The progress in disease increases inflammation and limit airflow which is characterized by edema, inflammation and mucus secretion

- **Airway hyper responsiveness**
  It is characterized by inflammation and dysfunctional neuroregulation and asthma can be controlled by treating these symptoms.

- **Airway remodeling**
  It involves structural changes which is permanent in many cells which obstruct the airflow and further limit the response to therapy (Anonymous, 2007).

![Fig. 1.1. Showing normal and inflamed airway](image)
1.5. Diagnosis

The asthma is diagnosed by conventional method and it involves detailed history of patients and physical examination. For the evaluation of airway responsiveness exercise challenge tests and methacholine inhalation tests are used. But these tests are not much sensitive to diagnose properly the
asthma and results are not also precise. Therefore chances of misdiagnosis of asthma are more in people, hence affect the life of patients.

1.6. Treatment of Asthma in various systems of medicine

1.6.1. Allopathic system of medicine

According to guidelines of NAEPP (National Asthma Education and Prevention Program), the diagnosis, management and treatment of asthma should include

1. Maintenance of normal activity, exercise
2. Maintenance of normal pulmonary function
3. Prevention of chronic symptoms
4. Prevent recurrent exacerbations

A number of individual medications are available for asthma but combination therapy can be used. The general treatment is given below (Mali and Shake, 2011).

1) Long-term control medications

It is taken throughout life on daily basis to maintain and avoid the asthma symptoms.

a) Inhaled corticosteroids

These drugs are anti-inflammatory and mostly used in effective treatment of asthma.

e.g. Fluticasone, Budesonide, Triamcinolone, Flunisolide and Beclomethasone. It may affect some children's growth. If any child is taking these medications, the growth rate of his or her must be regularly monitored. When used Long life the inhaled corticosteroids may causes skin thinning and bruising.

b) Long-acting beta-2 agonists

These are used to open the obstructed airways

e.g. Salmeterol and Formoterol can be used before exercise or breathe cold air. These drugs are used in combination on a regular schedule with inhaled corticosteroids.

c) Leukotriene modifiers
It helps to decrease the production of histamine and leukotrienes during an asthma attack. e.g. Montelukast and Zafirlukast these drugs may help prevent more attacks. Although these are not as effective as compared to inhaled corticosteroids.

d) Cromolyn and nedocromil
The inhaled Cromolyn or Nedocromil may help to prevent mild to moderate asthma attacks.

e) Theophylline
It is taken daily and used to treat night time symptoms of asthma. It may cause side effects, such as severe abdominal pain, diarrhea, confusion, fast irregular heartbeat, and nervousness.

2) Quick relief medications
It is also called “rescue” medications as they are used to stop the various symptoms of an asthma attack. These are taken as and when needed, but it is better to take these drugs if taken when patient feels symptoms of asthma.

a) Short-acting beta-2 agonists
It starts to work from minutes to six hours.
e.g. Albuterol and Pirbuterol.

b) Oral and intravenous corticosteroids
e.g. Prednisone, Methylprednisolone and Hydrocortisone treat acute asthma attacks or very severe asthma. The side effects upon long term use may include cataracts, osteoporosis and high blood pressure.

c) Ipratropium
It is taken for immediate relief of asthma symptoms.

3) Immunotherapy
It may help to treat the asthma which is not controlled by other medication. It will start with skin tests for determination of allergens, followed by therapeutic injections of allergens.

4) Anti-IgE monoclonal antibodies
The patient who has allergy produces IgE antibodies against allergens.
e.g. Omalizumab and Keliximab act by blocking the antibodies (Vemula, 2011).
1.6.2. Ayurvedic system of medicine

**Ayurveda concept:** In Ayurvedic science, Asthma is called as “Tamak-Shvasa”. The *Vata, Kapha and Pitta* are three *Doshas* (humors) which are involved in pathogenesis of asthma. According to Ayurveda when the cough (*kasa*) is increased in body then *Tamak-Shvasa* develops. These *doshas* classifies asthma into following types.

- Dry asthma (Air element)
- Infection asthma (Fire element)
- Congestion asthma (Water element)

Ayurveda states that, dyspnea and wheezing are the symptoms which are acute condition and affects the breath.

**Diagnosis:** It is done by observing the symptoms of *dosha*

**Management of patient:**

1. The *kapha* is removed by *svasavarodha*
2. *Srotosuddhi* is done to remove the *vata* induced bronchoconstriction.

**Medication:** Black pepper, Ginger, and turmeric each of one tea spoonful mixed with honey keep the chest clear. Application of balm on the chest and back containing Eucalyptus oil, Cinnamon oil and Clove oil helps in improving breath (*Gholve, 2015; Maurya, 2014*).

1.6.3. Homeopathic system of medicine

**Homeopathic concept:** The word “Homoeopathy” is obtained from two Greek words, *Homois* means similar and *pathos* stands for suffering.

**Medication:** Oral dose of 2.5 mL is effective

1.6.4. Unani system of medicine

**Unani concept:** Asthma is known as Zeequnnafas in Unani system of medicine

**Diagnosis:** Diseases are diagnosed by observing Nabz (pulse) and examination of urine and stool.

**Treatment:** Diseases are treated in the following different ways

(a) *IlajbilTadbeer* (Regimental Therapy)
(b) IlajbilGhiza (Dietotherapy)
(c) Ilajbil Dava (Pharmacotherapy)
(d) IlajbilYad (Surgery)

**Medication:** In this system drugs obtained from plant, animal and mineral origin are used. Patients are given single drug or combination of drugs (formulations of single drugs).

e.g. Habb-e-Hindi, Zeeqi, Kushta-e-Abrak, Siyah, Majoon Rahulmomineen etc. *(Usashri, 2013)*.

1.6.5. Siddha system of medicine

**Siddha concept:** According to the Siddha system of medicine the Universe is made of matter and energy. The Siddha calls them *Siva* as male and *Shakti* as female, creation.

**Medication:** The Siddha medicines are Bhasma, Churna, Kashaya, Lehya, Ghrita and Taila

1.6.6. Chinese system of medicine

The Chinese medication uses the drugs in combination of ten to sixteen herbs in which the principal drug is used to provide thrust and the drugs are secondary which enhances the therapeutic action of principal herb. Drugs from plants, animals and mineral origin are used for treatment of asthma.

1.6.7. Naturopathy

It utilizes natural substances to treat the patient. In the year 1895, The word "Naturopathy" coined by Dr. John Scheel.

**Concept:** It works on the principle of natural laws that work within and outside the body and makes use of natural sources such as air, water, light, exercise, heat, and food for curing the diseases.

**Treatment:** According to naturopaths asthma is caused by production of excess phlegm and inability to expel it from the body. Patient is advised, avoid the food which increases the phlegm such as milk, rice, curd and maida. Patients should consume food which does not produce phlegm such as
mango, green vegetables, tomato, carrots, papaya, orange and guava (Khatry and Abbulu, 2010).

1.7. Other treatments
Dietary supplements

a) Antioxidant foods and supplements: The published reports represented that consumption of low antioxidant nutrients (vitamins A, C, and E, selenium and other food chemicals) increases the chances of lung damage. Nutrients obtained from coloured fruits and vegetables which contain other chemicals that might be lung protective.

b) Fish oil: Omega-3 fatty acids from fish and in supplements have anti-inflammatory effects and may be helpful for asthma.

c) Immunity boosters
It contains combination of herbs which ultimately gives dietary supplement that stimulates and modulates the immune system.

d) Alternative treatment: supplements
Allergies are nothing but immune system imbalance. There are enzymes, fatty acids, herbs, minerals, and vitamins are helpful to maintain the immune system and allergic conditions.

Enzymes: Co-enzyme Q10 helps to improve the immune system and is found in healthy body not in a diseased body.

Fatty acids: These are useful because they produce the prostaglandins and counter attack the inflammation caused by allergies.

Herbs: Echinacea helps stimulation of immune system. Quercetin is also a safe and useful drug for treating various conditions of allergies including asthma and hay fever.

Minerals: Calcium, sulfur and magnesium are helpful in the treatment of allergies caused by food, dust, mites etc.

Vitamins: Vitamin A and Vitamin C is useful for allergy treatment.

e) Yoga for asthma
The asthma patients are advised to do
- Regular practice yoga
- Proper diet.
Observance to certain principles and advice.

**Asanas:** Ekpadauttan asana, Sarvang asana, Tada asana, Matsya asana, Yoga mudra, Simha asana, Shava asana, Ushtra asana, Pranayaman and Ujjayee pranayama. Beside these asana and pranayama, meditation is also useful.

**f) Fish treatment**

Bathini Goud family utilized this treatment 156 years ago and was kept secret over a century back, it was disclosed to Veeranna Goud, on the promise that the treatment should be given free of charge to asthmatic patients. The treatment is given at Doodhbowli, a mile away from Hyderabad (Vemula, 2011).

**1.7.1. Herbal Remedies (Pandey and Tripathi, 2014; Patel, 2013)**

Medicinal plants are being used since antiquity. Now a days, tremendous interest is found in the knowledge of medicinal plants and its ethnic uses in different parts of the world. Herbal remedies are considered as one of the old way to treat diseases known to mankind on this earth. Now the allopathic system of medicine is developed but the traditional systems of medicine that have flourished over the centuries within various communities, are still preserved as a basic traditional knowledge in herbal medicines. *Ocimum basilicum* and *Adhatoda vasica* are being used from long back for the treatment and cure of asthma.
### 1.7.2. Herbal drugs used in the treatment of asthma

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Plant name and Family</th>
<th>Plant part used</th>
<th>Chemical constituents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Achillea mellifolium</em>, Asteraceae</td>
<td>Flower</td>
<td>Alkaloids</td>
</tr>
<tr>
<td>2</td>
<td><em>Achyranthes aspera</em>, Amaranthaceae</td>
<td>Fruit</td>
<td>Saponins</td>
</tr>
<tr>
<td>3</td>
<td><em>Acorus calamus</em>, Araceae</td>
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<td>Asarone</td>
</tr>
<tr>
<td>4</td>
<td><em>Adhatoda vasica</em>, Acanthaceae</td>
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<td>Vascicine</td>
</tr>
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<td>5</td>
<td><em>Aegle marmelos</em>, Rutaceae</td>
<td>Leaves</td>
<td>Alkaloid, aegeline</td>
</tr>
<tr>
<td>6</td>
<td><em>Albizzia lebbeck</em>, Leguminosae</td>
<td>Bark</td>
<td>Alkaloids, flavonoids, and tannins</td>
</tr>
<tr>
<td>7</td>
<td><em>Ammi visnaga</em>, Umbelliferae</td>
<td>Seeds</td>
<td>Khellin</td>
</tr>
<tr>
<td>8</td>
<td><em>Asystasia gangetica</em>, Acanthaceae</td>
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<td>Saponins</td>
</tr>
<tr>
<td>9</td>
<td><em>Balanites roxburghii</em>, Simarubaceae</td>
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<td>Alkaloids</td>
</tr>
<tr>
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<td><em>Boswellia serrata</em>, Burseraceae</td>
<td>Root</td>
<td>Boswellic acid and Boswellin</td>
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<tr>
<td>11</td>
<td><em>Cassia sophera</em>, Caesalpiniae</td>
<td>Leaves</td>
<td>Flavonoids</td>
</tr>
<tr>
<td>12</td>
<td><em>Cedrus deodara</em>, Pinaceae</td>
<td>Wood</td>
<td>Himacholol</td>
</tr>
<tr>
<td>13</td>
<td><em>Centipeda minima</em>, Compositae</td>
<td>Whole plant</td>
<td>Pseudoguainolide and flavonoids</td>
</tr>
<tr>
<td>14</td>
<td><em>Clerodendron phlomidis</em>, Verbenaceae</td>
<td>Leaves</td>
<td>Flavonoids, steroids and terpenoids</td>
</tr>
<tr>
<td>15</td>
<td><em>Curculigo orchiodes</em>, Amarylliacae</td>
<td>Rhizomes</td>
<td>Saponin glycosides</td>
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<tr>
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<td><em>Curcuma longa</em>, Zingiberaceae</td>
<td>Rhizome</td>
<td>Curcuminoids</td>
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<td><em>Ephedra gerardiana</em>, Ephedraceae</td>
<td>Stem</td>
<td>Ephedrine</td>
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<td><em>Eucalyptus globules</em>, Myrtaceae</td>
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<td>Volatile oil</td>
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<tr>
<td>21</td>
<td><em>Inula racemosa</em>, Asteraceae</td>
<td>Zingiberaceae</td>
<td>Roots</td>
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<td><em>Lipidum sativum</em>, Cruciferae</td>
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<td>Asteraceae</td>
<td>Seed</td>
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<td>24</td>
<td><em>Myrica sapida</em>, Myricaceae</td>
<td>Asteraceae</td>
<td>Bark</td>
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<tr>
<td>25</td>
<td><em>Nigella sativa</em>, Ranunculaceae</td>
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<td>Seed</td>
</tr>
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<td><em>Ocimum sanctum</em>, Labiateae</td>
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<td>27</td>
<td><em>Passiflora incarnata</em>, Passifloraceae</td>
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<tr>
<td>28</td>
<td><em>Picorrhiza kurroa</em>, Scrophulariaceae</td>
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<td><em>Solanum xanhocarpum</em>, Solanaceae</td>
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<td><em>Terminalia belerica</em>, Combrataceae</td>
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<tr>
<td>32</td>
<td><em>Tinospora cordifolia</em>, Mensipermaceae</td>
<td>Asteraceae</td>
<td>Stem</td>
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</tbody>
</table>
References


Definition, Pathophysiology and Pathogenesis of Asthma, and Natural History of Asthma.


