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Bronchodilator Effect of *Bharangi Arka (Clerodendrum serratum)* Nebulization in Respiratory System: A Review

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Abstract

The *Nasa* (nose) according to *Acharya Charaka*, is the “gateway” to the head. The nasal route for the administration of drugs was widely used in Ayurveda for treating a variety of ailments. Bronchial asthma is wellknown hypersensitivity disorder which prevalence is being rapidly intensified in present world particularly in developed countries. *Tamaka Swasa* is correlate with Bronchial asthma, symptoms of *Tamaka Swasa* are nearly like Bronchial asthma. *Tamaka Swasa* can be treated by *Nasya Karma* followed by classical *Dhuma Nasya* and modified *Dhuma Nasya* (in the form of Nebulization). There are numerous varieties of drugs mentioned in Ayurvedic text which can be administered through nasal route, namely *nasya* and *dhumrapana* acts like that given through nebulization technique. According to the demand of time Ayurvedic science also requires some modification to become more permissive and harmonize with ever increasing diseases and their various presentations. The herbal drug *Bharangi* which used in nasal therapy in the form of *Arka* nebulization explained in classical text *Arka Prakash*. Key properties of *Bharangi* in the respiratory system are expectorant (Mucolytic), bronchodilator, immunomodulatory, anti-asthmatic, anti-inflammatory, antioxidant and anti-microbial. The paper will discuss the method and material use for the preparation of Ayurvedic nebulizer drug and its standardization.

Keywords: Bronchial Asthma, *Dhuma Nasya*, Nebulization, Scutellarein.

Introduction

According to *Ayurveda* “*Tamaka Shwasa* there are five classes of *Shwasa*. *Kshudra*, *Tamaka*, *Chhinna*, *Maha*, and *Urdhawa*. *Pratamaka shwasa* and *santamaka shwasa* are the two types of *Tamaka Shwasa* ^[1]. *Tamaka Shwasa* is a type of *Swasha rog* affecting the *pranava* srotas and characterized by prolonged expiration, wheeze, dyspnoea of exceedingly deep velocity, which is immensely injurious to life. *Tamaka Shwasa* classified as *Vata pradhana* and *Kapha pradhana*. *Vata* moving in the reverse order pervades the channels (of vital breath), afflicts the neck and head, and stimulates *kapha* to cause *Margavarodha* (Blockage of respiratory passage) by producing broncho constriction ^[2]. Signs and symptoms of *Tamaka Shwasa* are very much like that of bronchial asthma. Administered substances may include herbal oils (such as sesame oil or medicated ghee), extracts, or even powders designed to treat specific conditions like sinus issues, headaches, nasal congestion, or respiratory problems ^[3].

Nasya is an Ayurvedic treatment where medicinal substances, typically oils, powders, or liquids, are administered through the nasal passages. It is part of the *Panchakarma* (detoxification) procedures in Ayurveda and is believed to balance the *doshas* (*Vata*, *Pitta*, and *Kapha*) in the body, especially influencing the head and respiratory system ^[4].

Nebulization

Nebulization is the process of medication administration via inhalation. It utilizes a nebulizer which transports medications to the lungs by means of mist inhalation. It is a method of administration of drug by spraying it into the respiratory passage of the patient. The medication may be given with or without oxygen to help carry it into the lungs. Nebulizers use oxygen, compressed air or ultrasonic power to break up medical solutions and suspensions into small aerosol droplets that can be directly inhaled from the mouthpiece of the device. The definition of an aerosol is a “mixture of gas and liquid particles,” and the best example of a naturally occurring aerosol is mist, formed when small, vaporized water particles mixed with hot ambient air are cooled down and condense into a fine cloud of visible airborne water droplets. An aerosol is a mist of fine droplets ^[5].

Aims & Objectives

To provide rapid symptomatic relief by directly delivering the active chemical constituents of *Vasa* to the bronchi and lungs. Reduce breathlessness and wheezing by dilating the bronchi and loosening mucus. Enhance patient compliance through a non-invasive and soothing method of administration.

Epidemiology

According to the National Family Health Survey (NFHS) data, the prevalence of asthma in India varies across different rounds and demographic groups.

Acute Respiratory Infection Prevalence in Children under Age 5 Year (NFHS-4, NFHS-5) –

(https://www.mohfw.gov.in/sites/default/files/NFHS-5_Phase-II_0.pdf.)

The NFHS-4 & NFHS-5 collected data on self-reported acute respiratory infection among children under 5 years of age.

The Estimated Prevalence was:

- Prevalence of symptoms of acute respiratory infection (ARI) in the 2 weeks preceding the survey (%) –
NFHS – 5 (Urban – 2.3%) (Rural – 3.0%) (Total – 2.8%)
NFHS – 4 (Total – 2.7%)
- Children with fever or symptoms of ARI in the 2 weeks preceding the survey taken to a health facility or health provider (%) –
NFHS – 5 (Urban – 72.7%) (Rural – 67.8%) (Total – 69.0%)
NFHS – 4 (Total – 73.2%)

Asthma Prevalence in Children

A systematic review and meta-analysis of 33 studies involving 167,626 children estimated the pooled prevalence of asthma in India to be 7.9% (95% CI: 6.3–9.6%). The prevalence was higher among boys and in urban areas.

Method & Materials

Arka is a liquid formulation obtained by distilling medicinal substances soaked in water using the Arka Yantra or modern distillation equipment.

Preparation Method: Medicinal ingredients are cleaned, coarsely ground, and soaked in water overnight. The next day, the mixture is boiled in a distillation apparatus. The initial and final distillates are discarded, and the middle portion containing the active compounds is collected. Arka is a slightly turbid, coloured liquid with the aroma of the main herb used, reflecting the nature of its ingredients [6]. The herbal drug *Bharangi* which used in nasal therapy in the form of *Arka* nebulization explained in classical text *Arka Prakash* [7].

Drug Delivery Way: The aerosol mist created by this process rises from the top of the nebulizer and is delivered to the patient either through a facemask, or a connector which fits

into the mouth. The choice of facemask or mouthpiece is usually left to patient preference- although a higher dose is delivered with a mouthpiece. Liquids can be turned into aerosols small enough to be breathed into the lower respiratory tract using nebulizers. Atomization is the pneumatic process of dividing a bulk liquid into tiny droplets.

Mode of Action

Scutellarein, a quinazoline alkaloid primarily found in the plant *Bharangi* (*Clerodendrum serratum*), has been traditionally used in Ayurvedic and Unani medicine for respiratory ailments like bronchial asthma. Its mode of action in bronchial asthma involves several pharmacological mechanisms.

The major chemical constituents of *Bharangi* include [8].

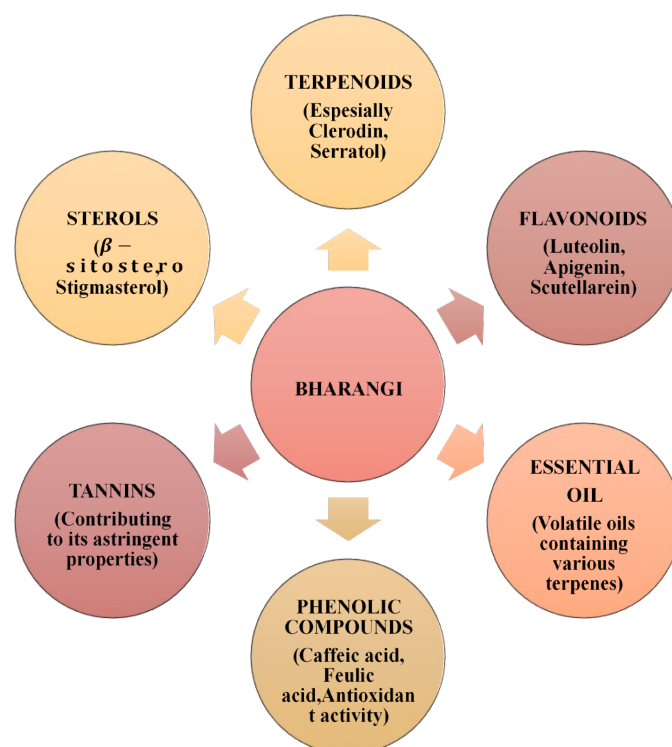


Fig 1: The major chemical constituents of *Bharangi*

1. Broncho-dilatory Action

Scutellarein acts as a bronchodilator, helping to relax bronchial smooth muscles. This reduces airway constriction.

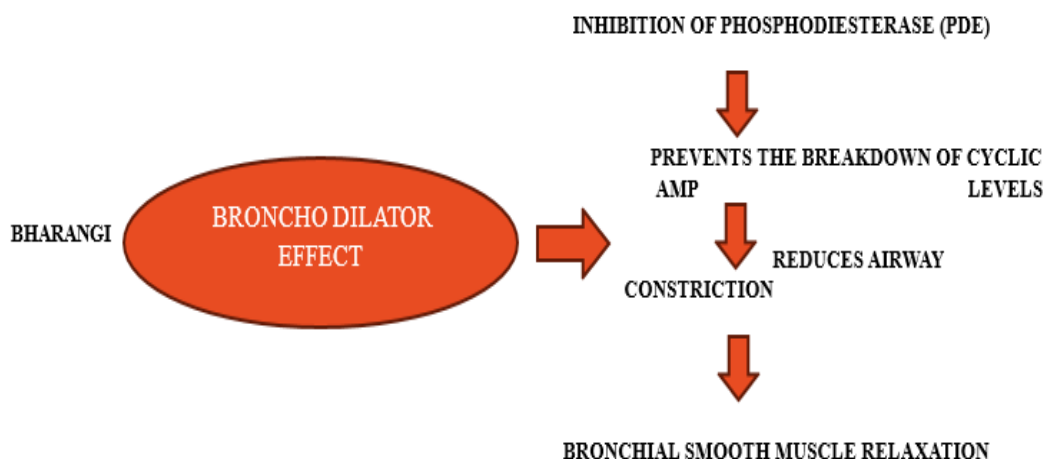


Fig 2: Broncho-dilatory Action

2. Membrane Stabilization

Reduces Mast Cell Degranulation → decreases histamine and leukotriene release

3. Anti-inflammatory Activity^[8]

Asthma is characterized by chronic airway inflammation. Scutellarein has shown anti-inflammatory effects, potentially by:

- Inhibiting pro-inflammatory cytokines like TNF- α and IL-6.
- Modulating pathways like NF- κ B involved in the inflammatory response.

4. Antioxidant Properties

Oxidative stress contributes to asthma pathogenesis. Scutellarein exhibits antioxidant activity, helping reduce oxidative damage in lung tissues, which may protect airway cells from Reactive oxygen species (ROS).

5. Antiallergic and Antihistaminic Effects^[8]

Though not as potent as synthetic antihistamines, Scutellarein may reduce allergic bronchoconstriction by modulating histamine release or action to some degree.

Discussion

The nasal cavity is covered by a thin mucosa which is well vascular. Therefore, a drug molecule can be transferred quickly across the single epithelial cell layer directly to the systemic blood circulation without first-pass hepatic and intestinal metabolism. The effect is often reached within 5 min for smaller drug molecules. Local therapeutic effects not well absorbed into the deeper layers of the skin or mucous membrane, lower risk of side effects, Transdermal route offers steady level of drug in the system. Inhalation deliver very small amounts of the medicine directly in the air way. The dose in this form is reduced to about 1/50th the dose delivered by tablet or injection thus the action of medicine is faster and there are no general side effects.

Nebulizers are used in the clinical treatment of conditions like asthma, bronchitis, COPD, cystic fibrosis and chest infections. The nebulizer is the container into which the liquid medication is loaded for conversion to an aerosol. The nebulizer is connected to the compressor outlet with a tube. The aerosol mist created by this process rises from the top of the nebulizer and is delivered to the patient either through a facemask, or a connector which fits into the mouth. The choice of facemask or mouthpiece is usually left to patient preference- although a higher dose is delivered with a mouthpiece.

Herbal plants are useful in the management and prevention of a wide range of illnesses and respiratory conditions. Research has shown that traditional medical systems can effectively treat respiratory illnesses, and that using plants to treat various respiratory conditions is also effective. Plants used for their medicinal properties have been used since ancient times. Most plants and certain other sources that contain phytoconstituents have been identified, and their efficacy in treating respiratory conditions has been evaluated. There is a long history of using traditional medicine to treat patients worldwide. The use of medicinal plants to treat illnesses and preserve public health is widespread throughout many cultures and countries. Natural products are crucial to the study and creation of novel medications.

Scutellarein, a quinazoline alkaloid primarily found in the plant *Clerodendrum serratum* (*Bharangi*), has been

traditionally used in Ayurvedic and Unani medicine for respiratory ailments like bronchial asthma. Scutellarein acts as a bronchodilator, allergic bronchoconstriction, anti-inflammatory effect, Expectoant Effect. For this reason, *Bharangi* is being used in the form of *Arka* nebulization to protect against bronchial asthma and other acute respiratory tract infections.

Conclusion

Acharya Charaka claims that the nose serves as the "gateway" to the head. In Ayurveda, the nasal route of medicine delivery was widely employed to treat a wide range of conditions.

It involves further research into optimized herbal formulations, effectiveness comparisons with conventional treatments, potential integration into mainstream healthcare, and exploring its adaptability for various respiratory conditions. This could lead to innovative solutions, increased natural treatment options, and possibly even a shift towards more holistic healthcare approaches in the future. The scope of future work may include investigating potential synergies between herbal extracts and conventional treatments, as well as delving deeper into the precise mechanisms and best formulations for nebulized herbal remedies. Stay up to date on research and advancements occurring around herbal treatment for respiratory ailments. In future for herbal plants used in nebulizers to treat respiratory problems and cold cough involves several potential avenues:

- Research and standardization
- Integration with conventional medicine
- Personalized medicines
- Innovations in delivery systems
- Clinical trials and evidence- based practice
- Global acceptance and regulations

By addressing these aspects, the future scope seeks to improve the efficacy, safety, and legitimacy of nebulized herbal medicines for respiratory health, providing supplementary and alternative options within the therapeutic paradigm. Keep an eye out for new findings and advancements in these fields.

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