



Repurposing of some Ayurvedic formulations as antiasthmatic agent: A review

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Abstract

Repurposing of herbal drugs already known to be safe as compare to conventional drugs and there is a huge gap between the use of traditional system of medicine and their pharmacological evaluation. Therefore, now-a-days efforts have been made to bring traditional and Ayurvedic medicine in mainstream, integrate its knowledge into modern healthcare with safety and efficacy. Ayurveda text has been written since 2000 BC, due to various environmental changes, it is necessary to evaluate and validate Ayurvedic concept scientifically to globally acceptance. There is large number of diseases posing threat to mankind which is due to altered immune system. Such case requires multidimensional response through anti-inflammatory and immunomodulation to strengthen immunity to fight against diseases. Ayurveda mentioned holistic approach and strategy to handle such kind of illness. Hence, there is an urgent need for novel treatment options, and Indian Ayurvedic system of medicines might prove to be one of the ways forward.

Keywords: Asthma, medicinal plants, antiasthmatic agents

Introduction

Asthma is a respiratory disorder caused by huge secretion of inflammation very similar to COVID-19 response and increasing occurrence in current pandemic has posed a situation that warrants urgent global attention. Clinically, inflammation caused lung damage in asthma which affects millions of human and causes considerable morbidity and mortality across the globe. In inflammatory response cytokine plays important role, in uncontrolled condition resulted release of huge amount of proinflammatory cytokines (IF- α , IF- γ , IL-1 β , IL-6, IL-12, IL-18, IL-33, TNF- α , and TGF β) as in COVID-19. Increased cytokines secretion impair the immune response makes the body more prone to attacks several disease and pathogen as well. Further overuse of some therapies can induce adverse effects in some patients such as increased risk of developing pneumonia and cardiac co-morbidities. Current treatment options for such conditions aim to alleviate symptoms, improve patient quality of life and prevent disease progression rather than cure the underlying condition itself. Though health and scientific community trying to find cure by repurposing of available drugs in conventional medicine but as a matter of fact, currently there is no preventive medicine available. Even, if available they produce severe side effects. Ayurveda emphasizes to use various herbal medicines to treat many illnesses by enhancing the body's overall natural resistance against the cause of disease. Further, an advisory guideline and various measures are issued by Ministry of AYUSH, Government of India including the use of certain Ayurvedic formulations which are quite effective to modulate and enhance the immunity at optimum level. As inflammation is a major cause of asthma and in several clinical studies, it has been observed that combined treatment of anti-inflammatory and immunomodulatory drugs may be more effective than single drug treatment based on the Ayurveda therapy. Alternative approaches to tackle the issue of severe side effects and reduced efficacy include the use of bioactive phytoconstituents. However growth in this area is

vulnerable by very less scientific evidence. Therefore, there is a need for appropriately conducted scientific research into the effects of safe, and efficacious plant medicines in asthma. Due to severe adverse effects of current treatment, an increasing number of research groups are beginning to consider herbal medicines as serious therapies for diseases, which has been the traditional opinion of most of the modern world. Earlier, mostly in Chinese and Indian cultures, plant formulations have been used to treat and prevent lung disease, and remain the same in modern era as a major therapeutic option. Therefore, mediation of the immune evasion of asthma is essential in its treatment and specific drug development. Immunomodulators agents maintain the body's immune system and help in regulate the normal condition whereas anti-inflammatory prevent extreme damage to the respiratory organs. Therefore, here a reviewed the literature which focused the novel and expensive biologic therapies are being developed from Ayurvedic formulations and their active ingredients to address this unmet need for prevention rather than the treatment of asthma. In the light of these facts, this review highlighted some Ayurvedic formulations viz. Pippalimuladi Kwath; Mahoushadhi Kwath; Tandravijayolwnani Kwath, and Kshudradi Kwath. All these formulations mainly used for fever and cough while their individual ingredients are well scientifically documented for antiasthmatic, anti-inflammatory, immunomodulatory, antiviral, antimicrobial activities etc and hence, here a small attempt in this review to make a step forward to establish Ayurvedic herbal drug repurposing [1-14].

1. Pippalimudali Kwath comprising of Pippali (*Piper longum*), Guduchi (*Tinosphora cardifolia*), Sunthi (*Zingiber officinale*).
2. Kshudradi Kwath contains Kantkari (*Solanum xanthocarpum*), Guduchi (*Tinosphora cardifolia*), Sunthi (*Zingiber officinale*), and Pushkarmool (*Inula racemos*).
3. Mahoushadhi Kwath consisting Sunthi (*Zingiber officinale*) Pushkarmool (*Inula racemos*), Amultus

- (*Cassia fistula*), senna (*Cassia angustifolia* and *C. acutifolia*), sugandhabala (*Pavonia odorata*), haritaki (*Terminalia chebula*), muesli (*Chlorophytum borivilianum*).
4. Tandravijyolbnani Kwath comprising Kantkari (*Solanum xanthocarpum*), Guduchi (*Tinospora cardifolia*), Sunthi (*Zingiber officinale*), and Pushkarmool (*Inula racemos*) haritaki (*Terminallia chebula*).
 5. The individual ingredients of selected formulations are reported to have antioxidant, anti-inflammatory, and immunomodulatory properties in the scientific literature.
 6. Shunthi (*Z. officinale*) is one of the most common house hold ingredient. It is natural anti-inflammatory, antioxidant, antibacterial and immunomodulator. In in-vitro study ginger prevented lymphocyte proliferation by reducing IL-2 and IL-10 production *in vitro* study. In one more study, include ginger as diet for 12 weeks showed increased haematocrit, haemoglobin, erythrocyte, MCH, MCHC, WBC, and neutrophils percentage. Essential oil of ginger also exhibited improvement in humoral and cell mediated immune response in immune-suppressed mice [15-17].
 7. Pippali (*Piper longum*) described as a medicament rather than a spice by Hippocrates. In Ayurveda it is described and classified as rasayana with ample role in various diseases. More than 14 active constituents have been isolated from pippali and reported various pharmacological activities including anti-inflammatory, antioxidant, bioavailability enhancer, and immunomodulatory activities. Lipid peroxide levels and glutathione content significantly reduced with pet ether extract of pippali. On human para influenza virus pippali exhibited antiviral effect in-vitro has also been reported. It also increase total WBC count to 14%. In Ayurvedic formulations pippali is used as rasayana which exhibit specific and nonspecific immunostimulatory actions in *Giardia lamblia* infected mice [18-21].
 8. Guduchi (*Tinospora cardifolia*) is well known herb to treat especially respiratory system through immunomodulatory action and also documented for anti-viral and anti-inflammatory potential. Phytochemically, dry stem extract of guduchi contains polyclonal B cell mitogen and G1-4A which is reported enhance the immunity and reduce ROS in radiation induced immunosuppression in mice [22-24].
 9. Haritaki (*Terminalia chebula*) is well documented as lipid lowering agent. It is an excellent antioxidant as reported to have anti-superoxide radical formation and free radical scavenging activities. Bioactive phytoconstituents of haritaki also exhibit the effect on influenza virus. In immunomodulation study, haritaki showed improved humoral immunity where T-cell counts remained unaffected while cell-mediated immune response stimulated. Aqueous extract also increase human antibody titer and delayed type hypersensitivity in another report [25-29].
 10. Senna (*Cassia angustifolia* and *Cassia acutifolia*) is traditionally and scientifically known for its laxative property. Senna contains anthraquinone glycosides such as chrysophanol, physcione along with lupeol (triterpine) and quercetin responsible for anti-inflammatory, antioxidant, antitumor, antimicrobial, and cardioprotective activities [30, 31].
 11. Muesli (*Chlorophytum borivilianum*) In Indian Ayurvedic system of medicine this plant is classified as Rasayana. Rasayana helps to rejuvenate the body and prevent diseases through modulate immune response. A lot of scientific literature available on muesli reported immunomodulating activity [32, 33].
 12. Amultus (*Cassia fistula*) In Ayurveidic system of medicine amultus is used to treat inflammatory swellings. It acts as local antiseptics by decreasing purulent secretion. Its fruits are used as laxative [34, 35].
 13. Sugandhabala (*Pavonia odorata*) In Ayurveda its essential oil is used as cooling agent and stomachic. This plant has natural healing and used in combination with other plant to treat fever, inflammation, and haemorrhage. Sugandhabala stimulates nervous system, reduce spasm and flatulence [36, 37].
 14. Pushkarmool (*Inula racemosa*) Root of this plant is used in dyspnoea, asthma, chest pain and particularly in cough. Aqueous extract of root significantly reduce rhematic pain and blood sugar level in diabetes. Pushkarmool is an important ingredient of several Ayurvedic formulations for inflammatory conditions and heart diseases [38, 39].
 15. Kantkari (*Solanum xanthocarpum*) According to classic text, kantkari is useful in different respiratory tract diseases. Scientifically it has various medicinal activities such as antimicrobial property, antifilarial, anti-inflammatory activity, hepatoprotective activity, hypoglycemic activity, apoptosis-inducing activity and hypolipidemia [40, 41].
- Scientifically, all the active ingredients of above selected formulations are potent combination of antiviral, antioxidant, anti-inflammatory, and immunomodulatory components which may help in treating and preventing further progression of asthma as well as viral disease. However, as per the detailed literature survey, these four formulations are not yet explored for antisthmatic potential through anti-inflammatoiry and immunomodulatory pathway.

Conclusion

According to classic text as well as scientific literature some medicinal plants relax the muscles of the respiratory tract, some boost the immune system, some soothe and calm the irritated nasal passage ways and some act as an expectorant, which are beneficial and helps to modulate respiratory tract, suggested alternative or add-on therapy. In clinical condition like fever and cough selected formulations are to be used but rarely used in asthmatic patients as per Ayurvedic classical text. Scientifically these ingredients reported to have anti-inflammatory, immunomodulator and antiasthmatic effect.

Hence, it is hypothesized that these formulations can have great potential for asthma through anti-inflammatory and immunomodulation activity due to synergistic combination of ingredients in the formulation and thus there is need to explore them as an antiasthmatic rather than antipyretic formulation (fever). The encouraging result of such type of research will escort the first step for their scientific justification of repurposing of available drugs in asthma therapy instead of fever. This review may help to develop

cure and preventive medication for vast population of Asian countries, where Ayurvedic and traditional system of medicine is already well acknowledged.

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