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**Research Paper**

# Overutilization of Rescue Inhalers in Asthma Management: Clinical Risks, Physiological Consequences, and the Potential Role of Complementary Phytotherapy

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## ABSTRACT

Asthma is a chronic inflammatory airway disease in which effective long-term control depends on reducing airway inflammation and relieving symptoms when they occur. Short-acting beta$_2$-agonists (SABAs), including salbutamol, provide rapid relief from acute symptoms; however, frequent reliance on these medications is an important warning sign of inadequate asthma control. Repeated SABA use may also be associated with tremor, palpitations, tachycardia, and hypokalaemia, while persistent over-reliance may increase the risk of exacerbations and poorer clinical outcomes. Effective asthma management therefore requires appropriate controller therapy, correct inhaler technique, medication adherence, trigger avoidance, and regular clinical review. Lifestyle measures and selected plant-based preparations may have a supportive role but should not replace established asthma treatments. This review discusses the causes of rescue-inhaler overuse, its physiological and clinical consequences, preventive approaches, and the potential supportive role of a standardized polyherbal syrup containing Tulsi, ginger, garlic, amla, turmeric, anjeer, and vidanga.

## INTRODUCTION

Asthma is a common chronic respiratory disorder characterized by airway inflammation, variable airflow limitation, bronchial hyperresponsiveness, and recurrent episodes of symptoms such as wheezing, coughing, chest tightness, and shortness of breath. It affects individuals across all age groups and may significantly interfere with daily activities, sleep, education, work, and overall quality of life. The burden of asthma is unevenly distributed among populations due to differences in environmental exposures, air pollution, socioeconomic conditions, healthcare accessibility, medication affordability, and the quality of long-term disease management.

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Effective asthma management requires both **long-term control of airway inflammation and rapid relief of acute symptoms**. Controller medicines, particularly inhaled corticosteroids (ICS), play a central role in reducing airway inflammation, improving symptom control, and decreasing the risk of future exacerbations. Depending on disease severity and individual requirements, other controller therapies may also be prescribed. In contrast, short-acting beta$_2$-agonists (SABAs), such as salbutamol, produce rapid bronchodilation and are commonly used for temporary relief of acute asthma symptoms.

The rapid improvement in breathlessness after using a rescue inhaler can create a perception among patients that the reliever is the most effective or essential component of asthma treatment. However, symptomatic improvement does not necessarily indicate adequate control of the underlying airway inflammation. Consequently, frequent reliance on rescue inhalers may occur when patients have inadequate controller therapy, poor adherence to prescribed treatment, incorrect inhaler technique, or insufficient understanding of asthma management.

**Rescue inhaler overuse is an important clinical concern** because frequent use may indicate poorly controlled asthma and an increased risk of future exacerbations. Some patients may repeatedly increase their reliever use rather than seeking medical assessment or reviewing their controller treatment. This pattern can delay appropriate intervention and may contribute to avoidable emergency visits, hospitalizations, reduced quality of life, and increased healthcare costs. In addition, excessive dependence on SABA therapy may mask worsening disease and create a false sense of security because the immediate symptoms are temporarily relieved.

Several factors can contribute to rescue inhaler overuse, including inadequate patient education, misconceptions regarding controller medicines, fear of corticosteroid-related adverse effects, poor adherence, improper inhaler technique, easy availability of reliever inhalers, environmental triggers, and limited follow-up with healthcare professionals. Identifying patients who frequently use rescue inhalers therefore provides an opportunity for pharmacists, physicians, and other healthcare professionals to assess asthma control and intervene at an early stage.

Pharmacists have an important role in addressing this issue through **patient counselling, inhaler-technique assessment, adherence monitoring, medication review, identification of drug-related problems, and education regarding the appropriate role of controller and reliever medicines**. Regular monitoring of rescue inhaler use can also help healthcare professionals recognize patients who may require reassessment of their asthma management plan.

Therefore, understanding the pattern of rescue inhaler use and the factors associated with its overutilization is essential for improving asthma outcomes. A rational approach that combines appropriate pharmacotherapy, patient education, regular monitoring, and individualized follow-up can help reduce unnecessary rescue inhaler dependence and support better long-term asthma control.

## 1. Pathophysiology of Rescue and Controller Inhalers

Rescue and controller inhalers work through different mechanisms and have different purposes. SABAs primarily produce rapid bronchodilation, whereas ICS-based treatment targets the inflammatory component of asthma. Understanding this distinction is central to reducing inappropriate reliance on rescue medication.

| *Therapeutic property* | **Rescue inhalers (SABAs)** | **Controller inhalers (ICS)** |
|---|---|---|
| ***Main target*** | Beta2-adrenergic receptors on bronchial smooth muscle | Airway inflammatory pathways and mucosal cells |
| ***Main action*** | Rapid relaxation of bronchial smooth muscle and improvement in airflow | Reduction of airway inflammation and inflammatory mediator activity |
| ***Onset*** | Usually within minutes | Clinical benefit develops with regular use over time |
| ***Effect on inflammation*** | Does not provide adequate control of the underlying inflammation | Directly addresses the inflammatory component of asthma |
| ***Long-term role*** | Primarily for symptom relief according to the prescribed asthma plan | Foundation of long-term preventive treatment when indicated |

SABAs activate beta2 receptors and increase intracellular cyclic AMP, producing relaxation of airway smooth muscle. This can rapidly improve wheezing and breathlessness. The benefit, however, is mainly bronchodilatory; it does not replace anti-inflammatory treatment. If airway inflammation remains inadequately controlled, symptoms can recur even after an apparently successful rescue dose.

With poorly controlled asthma, continuing inflammation may contribute to structural and functional changes in the airways, including increased smooth-muscle mass and airway hyperresponsiveness. For this reason, repeated use of a rescue inhaler should prompt assessment of asthma control rather than simply an increase in reliever use.

## 2. Reasons for Rescue-Inhaler Overuse

Rescue-inhaler overuse rarely has a single cause. It can arise from misunderstanding of treatment, concerns about controller medicines, poor inhaler technique, persistent exposure to triggers, psychological factors and difficulties accessing regular medical care.

Misunderstanding symptom relief: Because salbutamol can improve symptoms within minutes, some patients may interpret the improvement as evidence that the asthma itself has been treated. This can make a fast-acting reliever more attractive than a preventive medicine that does not provide an immediate sensation of relief.

Concerns about corticosteroids: Fear of adverse effects may lead some patients to avoid or reduce their prescribed ICS. Clear counselling about the purpose, dose and route of inhaled corticosteroids can help address these concerns.

Incorrect inhaler technique: Errors such as poor coordination, inadequate inspiratory technique or failure to use a prescribed spacer can reduce the amount of medicine reaching the lungs. Patients may then use the inhaler more often because the expected relief is incomplete.

Access and behavioural factors: Irregular follow-up, medication costs, easy access to reliever medicines and self-treatment of recurring symptoms can all contribute to excessive use. Anxiety associated with breathlessness may also encourage patients to use the inhaler at very early or mild symptoms.

## 3. Systemic Risks and Physiological Effects of Overuse

Although inhaled SABAs are designed to act mainly in the airways, repeated or high doses can produce systemic beta-adrenergic effects. The severity of these effects varies with dose, individual susceptibility and the clinical setting.

Tachycardia and palpitations: Beta-adrenergic stimulation can increase heart rate and cardiac

contractility, producing palpitations or a sensation of a racing heartbeat.

Tremor and nervousness: Stimulation of beta2 receptors in skeletal muscle can cause fine tremor, restlessness or nervousness, particularly after repeated doses.

Hypokalaemia: High beta2-agonist exposure can promote movement of potassium into cells, lowering serum potassium. Significant hypokalaemia may contribute to muscle weakness or cardiac rhythm disturbances.

Reduced response with repeated exposure: Frequent SABA exposure can be associated with beta2-receptor desensitization, which may reduce bronchodilator responsiveness. This is one reason why increasing reliance on a reliever is a clinical warning sign.

Exacerbations and poor disease control: Frequent reliever use may accompany persistent airway inflammation and is associated with a greater risk of asthma exacerbations. The key clinical problem is therefore not only the medicine itself, but also the uncontrolled disease that the repeated use may indicate.

Cardiovascular and mortality concerns: Observational studies have reported associations between high SABA use and serious cardiovascular events and asthma-related adverse outcomes. These findings reinforce the need to investigate frequent reliever use rather than treating it as a normal long-term pattern.

## 4. Clinical Management and Prevention

Reducing rescue-inhaler overuse requires a practical and patient-centred approach. The first step is to identify why the patient is using the reliever frequently and then address the underlying problem.

Patient education: Explain clearly that a rescue inhaler is intended to provide rapid symptom relief, while controller treatment is used to reduce airway inflammation and prevent future symptoms. Education should be reinforced during follow-up visits.

Inhaler-technique assessment: Technique should be demonstrated, observed and corrected rather than assumed to be adequate. Reassessment is particularly important when symptoms remain uncontrolled despite prescribed treatment.

Treatment optimization: Controller therapy should be reviewed according to the patient's asthma severity, current level of control and treatment plan. Patients should be encouraged to follow their prescribed regimen rather than compensating for poor control with repeated reliever doses.

Written action plan: A personalized asthma action plan can help patients recognize worsening symptoms and understand when to adjust treatment or seek medical attention.

Monitoring reliever use: Prescription and refill patterns can help identify patients who are repeatedly obtaining rescue inhalers. Digital or connected inhaler systems may provide additional information about actual use when available.

Trigger management: Smoking, tobacco smoke, allergens, occupational exposures, air pollution and other individual triggers should be considered as part of routine asthma assessment.

## 5. Lifestyle Measures and Complementary Phytotherapy

Asthma care should not be limited to medicines alone. Maintaining a healthy body weight, obtaining adequate sleep, remaining physically active within individual tolerance, reducing exposure to tobacco smoke and managing relevant environmental triggers can support overall respiratory health. A balanced diet rich in fruits, vegetables and other sources of antioxidant nutrients may also contribute to general health.

Several medicinal plants have traditionally been investigated for anti-inflammatory, antioxidant or respiratory-supportive properties. However, evidence for their effectiveness in asthma varies,

and laboratory or traditional use should not be presented as proof of clinical efficacy. Any herbal preparation should therefore be considered complementary rather than a replacement for prescribed asthma therapy.

Garlic (Allium sativum): Contains organosulfur compounds such as allicin and related constituents. Garlic has been investigated for antioxidant and anti-inflammatory activity, although clinical evidence specific to asthma remains limited.

Ginger (Zingiber officinale): Contains gingerols and shogaols and has demonstrated anti-inflammatory activity in experimental research. Its possible effects on airway smooth muscle and respiratory symptoms warrant further clinical evaluation.

Turmeric (Curcuma longa): Curcuminoids have antioxidant and anti-inflammatory properties and can influence pathways such as NF-kappa B in experimental systems. Clinical evidence is still needed to establish a clear role in routine asthma treatment.

Amla (Phyllanthus emblica): Provides vitamin C, polyphenols and other antioxidant compounds. It may contribute to nutritional antioxidant support, but its specific therapeutic benefit in asthma requires clinical validation.

Tulsi (Ocimum sanctum): Traditionally used for respiratory complaints and contains compounds including eugenol and ursolic acid. Evidence supporting a direct clinical effect in asthma is not yet sufficient to replace standard treatment.

Anjeer (Ficus carica) and Vidanga (Embelia ribes): These plants are used in traditional preparations and contain various nutrients or bioactive compounds. Their inclusion in a respiratory-support formulation should be evaluated for safety, quality, dose and clinical effectiveness.

## 6. Standardized Polyherbal Syrup Matrix (RespiVeda)

A polyherbal syrup such as the RespiVeda model described in the source document is intended as a supportive preparation combining several plant extracts in a defined oral dosage form. The formulation should be manufactured under appropriate quality-control conditions, with attention to identity, purity, extraction method, pH, microbial quality, stability and batch-to-batch consistency.

Proposed manufacturing sequence

Raw-material quality assessment: authenticate and inspect Tulsi, ginger, garlic, amla, turmeric, anjeer and vidanga before processing.

Aqueous extraction: prepare the herbal extracts using purified water under controlled heating, followed by filtration and concentration.

Vehicle preparation: dissolve and clarify the jaggery base under controlled conditions.

Compounding and preservation: combine the standardized extracts with the vehicle and add sodium benzoate at an appropriate, validated concentration.

Standardization and filling: adjust the final volume and pH, perform final filtration where appropriate, and fill into suitable protective containers under hygienic conditions.

Composition per 10 mL (as described in the source document)

| ***Component*** | **Amount** | **Intended supportive role** |
|---|---|---|
| ***Tulsi extract*** | 100 mg | Traditional respiratory support and mucus-related symptom support |
| ***Ginger extract*** | 100 mg | Traditional anti-inflammatory and soothing support |
| ***Garlic extract*** | 100 mg | Antioxidant and traditional anti-inflammatory support |
| ***Amla extract*** | 100 mg | Source of vitamin C and polyphenolic compounds |
| ***Turmeric extract*** | 50 mg | Source of curcuminoids with antioxidant and anti-inflammatory potential |

| | | |
|---|---|---|
| ***Anjeer/Fig extract*** | 50 mg | Nutritional and soothing support |
| ***Vidanga extract*** | 25 mg | Traditional herbal component; supportive role requires validation |
| ***Jaggery base*** | 250 mg | Syrup vehicle and palatability |
| ***Sodium benzoate*** | q.s. | Preservative, subject to applicable quality and regulatory requirements |

Importantly, the polyherbal syrup should not be described as a substitute for inhaled corticosteroids, prescribed reliever therapy or other evidence-based asthma treatment. Claims that it reduces rescue-inhaler dependence or improves asthma control require appropriate clinical evidence. Until such evidence is available, its role should be limited to supportive or investigational use.

## CONCLUSION

Frequent use of rescue inhalers is an important marker that asthma may not be adequately controlled. Although SABAs remain valuable for rapid symptom relief, repeated reliance on them can expose patients to systemic adverse effects and is associated with a higher risk of poor asthma outcomes. The most effective response is not simply to restrict access to a reliever, but to identify why it is being used so often and correct the underlying problem.

Patient education, accurate inhaler technique, adherence to appropriate controller therapy, individualized action plans, regular review and management of environmental triggers form the core of prevention. Lifestyle measures and carefully standardized herbal preparations may offer additional supportive value, but their claims should remain consistent with the strength of available evidence. Further controlled clinical studies are needed before any specific polyherbal formulation can be recommended as an established treatment for asthma.

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