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Original Research Article

Therapeutic Effects of Thai Herbal Nasal Steam Inhalation Therapy for the Treatment of Persistent Allergic Rhinitis

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ABSTRACT

Traditional Thai herbal therapy has historically been used for management of allergic rhinitis. However, there was limited evidence of Thai herbal formulation in allergic rhinitis. This study aimed to evaluate the therapeutic effects of Thai herbal formulation for treating allergic rhinitis. A pre-post study was performed to evaluate the effectiveness of Thai herbal formulation in treating allergic rhinitis. The patients had herbal steam inhalation treatment for twenty minutes, twice weekly (10 minutes each session, 2 sessions, with a 10-minute interval between sessions) for a duration of two months. Thirty participants completed the Total Nasal Symptom Score (TNSS) and the Rhinoconjunctivitis Quality of Life Questionnaire (Rcq-36). The average age was 20.5 ± 0.63 years, with congestion being the most common clinical complaint at 90%, followed by itching at 80%, discharge at 73.33%, sneezing at 53.33%, and dyspnea at 20%. Following two months of therapy, TNSS and Rcq-36 scores exhibited statistically significant improvements ($p < 0.05$) in response to the herbal formulation therapy, compared to the baseline. The findings indicated that the Thai herbal formulation was significantly advantageous in alleviating overall nasal symptoms and enhancing the quality of life related to rhinoconjunctivitis in the treatment of perennial allergic rhinitis.

Keywords: Thai herbal formulation, Total Nasal Symptom Score, Rhinoconjunctivitis Quality of Life Questionnaire, allergic rhinitis

Introduction

Allergic rhinitis is an increasingly prevalent health concern, causing considerable burden and disability globally. Allergic rhinitis is an inflammatory condition of the nasal mucosa induced by allergen exposure, marked by IgE-mediated inflammation and clinically identified by four primary symptoms: rhinorrhea, sneezing, nasal pruritus, and nasal obstruction.[1] Allergic rhinitis may result in disturbances in sleep patterns, emotional instability, diminished capacity to engage in everyday activities, significantly impaired quality of life, and considerable financial repercussions. Furthermore, the illness acts as a trigger for further disorders, including bronchial asthma.[2,3] The conventional management of allergic rhinitis often includes allergen avoidance, pharmacotherapy, immunotherapy, and patient education. Second-generation H1 antihistamines, nasal glucocorticosteroids, and leukotriene antagonists are recommended as the principal therapy. As a result of unsatisfactory results from traditional medication, people with allergic rhinitis are increasingly seeking complementary and alternative therapies.[4,5] Thai herbal therapy is a well-recognized strategy for patients with allergic rhinitis considering complementary and alternative treatments to alleviate symptoms.

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Many studies have demonstrated the effectiveness of Thai herbal medicine, such as Ginger capsules,[6] Phlai capsules,[7] and Prabchompoothaweep,[8] in treating allergic rhinitis, as these herbs promote symptom alleviation through immune modulation and possess anti-allergic or anti-inflammatory properties. Furthermore, prior research has found that the inhalation of herbal medication markedly reduces symptoms of allergic rhinitis, principally via modifying inflammation and neurotransmission, notably within the olfactory bulb and anterior cingulate cortex, which are relevant brain regions.[8,9] Moreover, intranasal herbal therapies at lower dosages often exhibit superior efficacy compared to oral administration due to their noninvasive nature, excellent absorption, and rapid effects.[9] Thus, the objective of this study was to evaluate the possible therapeutic advantages of nasal inhalation of a Thai herbal formulation for alleviating symptoms of allergic rhinitis.

Materials and Methods

Study design and patients

A quasi-experimental clinical investigation was conducted at the Faculty of Traditional Thai Medicine, Prince of Songkla University, Thailand. The research protocol received approval from the Ethics Committee of the Faculty of Traditional Thai Medicine at Prince of Songkla University (reference number: EC.66/TTM.01-007) and was registered with the Thai Clinical Trials Registry (registration ID: TCTR20250204011). The participant who consented to participate completed a written informed consent form at the study's commencement and was enrolled for a duration of eight weeks.

The criteria for inclusion were as follows:[11] (1) adults aged 20 and above; (2) those with persistent allergic rhinitis; (3) participants who actively engaged in the research by obtaining informed permission. The exclusion criteria were specified as follows: (1) participants with uncontrolled systemic diseases or critical infections; (2) participants who have previously undergone treatment for chronic illnesses, substance abuse or dependence, and pregnant or breastfeeding women;

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(3) participants with psychiatric disorders and self-identified immunocompromised states; (4) participants with a history of allergies to any Thai herbal remedies.

Treatment interventions
Thai herbal formulation (Table 1) was infused in water at temperatures ranging from 42 to 44℃ for nasal steam inhalation therapy. All participants had herbal steam inhalation therapy for twenty minutes, twice weekly (10 minutes each round, 2 rounds, with a 10-minute intermission between rounds), for a duration of eight consecutive weeks.

Outcome measurements
Outcomes were evaluated at baseline and post-treatment. The primary outcome was nasal symptoms, quantified by the total nasal symptom score (TNSS).[12] Secondary outcomes included the quality of life related to rhinoconjunctivitis, assessed by rhinoconjunctivitis quality of life questionnaires (Rcq-36).[13]
The Total Nasal Symptom Score (TNSS) aggregates scores for nasal congestion, sneezing, nasal itching, and rhinorrhea at each time point on a four-point scale (0-3), where 0 signifies the absence of symptoms, 1 denotes mild symptoms that are easily manageable, 2 represents bothersome yet tolerable symptoms, and 3 indicates severe symptoms that disrupt daily activities. The TNSS score is the aggregate of the symptom scores, with a maximum of 12.[12]
The 36-questions Rcq-36 encompasses 6 domains and two independent elements. The 6 domains and their respective question counts are as follows: rhinitis (4 questions), eye (4 questions), learning or job (3 questions), sleep (3 questions), social function (5 questions), and emotional function (5 questions). The two distinct inquiries evaluate overall health and days absent from work due to allergic rhinitis.[13]

Statistical analysis
Statistical analysis was conducted with R statistical program (version 4.4.1). Qualitative data were expressed in numbers and percentages. Quantitative data were presented as a median with inter-quartile range (IQR) for non-normally distributed data and as a mean ± standard deviation (SD) for normally distributed data. The paired t-Test (for regularly distributed data) and the Wilcoxon paired signed-rank test (for non-normally distributed data) were employed to compare paired pre- and post-treatment quantitative measurements. All tests were two-tailed, with $p < 0.05$ considered significant.

Results and Discussion

Participant enrollment
A total of 30 participants (female = 24 and male = 6) were enrolled from Faculty of Traditional Thai Medicine, Prince of Songkla University, Thailand (Figure 1). At the end of the experiment, all participants completed the study without significant adverse effects. A baseline assessment of the demographic and clinical features of participants were collected before treatment (Table 2). Thirty participants had an average age of 20.5 ± 0.63 years. The most prevalent clinical symptom among participants was congestion (90%), followed by itching (80%), discharge (73.33%), sneezing (53.33%), and dyspnea (20%).

Treatments and clinical outcomes
Therapeutic effects of Thai herbal medicine formulation on perennial allergic rhinitis including total nasal symptoms and rhinoconjunctivitis quality of life were demonstrated using Total Nasal Symptom Score (TNSS) and Rhinoconjunctivitis Quality of life questionnaires (Rcq-36), respectively. The results indicated that at week 8 following the commencement of Thai herbal formulation, all benchmarks total of TNSS and Rcq-36 scores responded to the herbal formulation intervention with statistically significant differences ($p < 0.05$), compared to the baseline (Figure 2, Table 3-5). Thai herbal formulation was significantly effective in improving total nasal symptoms including congestion, discharge, itching, and sneezing (Table 3), compared to the baseline. Thai herbal formulation demonstrated significant improvements in Rhinoconjunctivitis Quality of life including symptoms (rhinitis symptoms, eye symptoms, and other symptoms), sleep problem, social functioning, and emotions (Table 4-5), compared to the baseline. Regarding adverse events, no obvious adverse reactions were observed in this study.

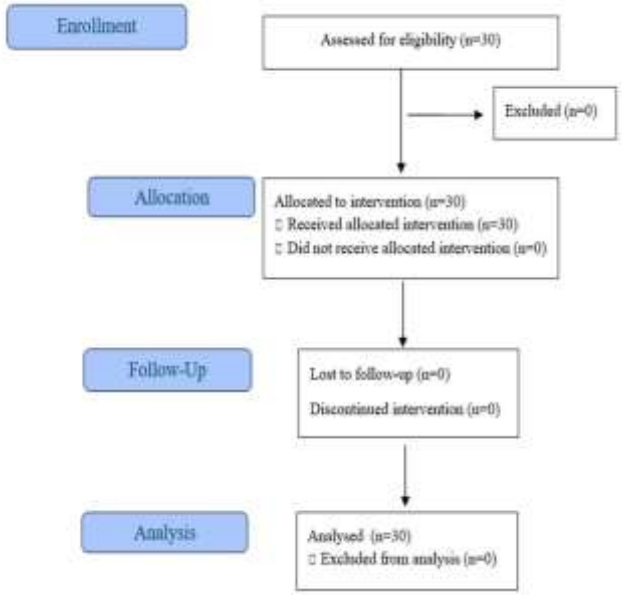

Figure 1: Flow chart of the study

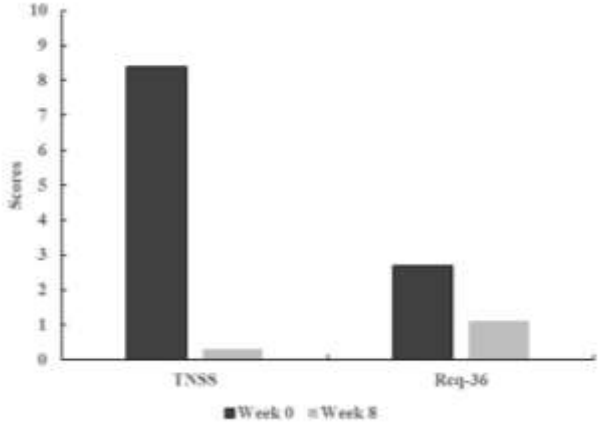

Figure 2: Total nasal symptoms score (TNSS) and Rhinoconjunctivitis quality of life questionnaires (Rcq-36) improvement in allergic rhinitis patients after treatment with traditional Thai herbal formulation

Traditional Thai herbal medicines have been used for the treatment of respiratory system infections for centuries.[14,15] However, there was little evidence of Thai herbal formulations among patients with allergic rhinitis. This study aimed to evaluate the therapeutic effectiveness of a Thai herbal formulation comprising *Allium ascalonicum*, *Citrus hystrix*, *Cymbopogon citratus*, *Zingiber officinale*, *Acacia concinna*, *Solanum indicum*, *Cinnamomum camphora*, and *Pogostemon cablin* for the treatment of allergic rhinitis. The eight medicinal plants have been used in traditional Thai medicine as beneficial herbal medicines.[16] The chemical elements found in eleven medicinal plants are acknowledged for their advantageous health benefits, particularly as anti-inflammatory, anti-histamine, anti-oxidant, and anti-microbial agents with the ability to function as immunomodulators[17-24] (Table 1). The results displayed that the Thai herbal formulation was significantly effective in enhancing overall nasal symptoms and improving the quality of life associated with rhinoconjunctivitis in the treatment of persistent allergic rhinitis.

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Table 1: Traditional Thai herbal formulation for allergic rhinitis

Scientific name (Family)	Part used	Ethnomedical use	Pharmacological activity	Phytochemicals
Allium ascalonicum Linn. (Amaryllidaceae)[17]	bulb	nasal congestion	anti-allergic, anti-inflammatory, immunomodulatory, anti-oxidant	quercetin 3,4'-diglucoside, quercetin 4'-glucoside, quercetin
Citrus hystrix DC. (Rutaceae)[18]	fruit peel	headache, fever	anti-inflammatory, immunomodulatory, antibacterial	alpha-terpineol, terpinene-4-ol, and citronellal
Cymbopogun citratus (Poaceae)[19]	stalk	asthma and other respiratory allergies, fever, inflammation	anti-allergic, anti-inflammatory, immunomodulatory	2-hydroxy-4-methyl2-pentanone, elemol, β-esdesmol, oplapanone, nerolidol epoxyacetate, phytol acetate, eicosanoic acid methyl ester, palmitic acid, phytol
Zingiber officinale Roscoe (Zingiberaceae)[20]	rhizome	respiratory disorders	anti-allergic, anti-inflammatory, immunomodulatory, anti-oxidant, antimicrobial	6-gingerol
Acacia concinna (Willd.) DC. (Fabaceae)[21]	leaf	cough, expectorant, malarial fever	anti-inflammatory, immunomodulatory, chronic cough, asthmatic obstruction, antioxidant, antibacterial	pimozide, senkyunolide M, 1-Penten-3-ol, 1-heptadecanol, epanolol, schisanhenol B, tamoxifen N-oxide, misoprostol, Stearamide
Solanum indicum L. (Solanaceae)[22]	fruit	chronic bronchitis, fever, asthma	anti-inflammatory, immunomodulatory	solanigrosides Y1, α-solanine, solamargine, degalactotigonin,
Cinnamomum camphora (Lauraceae)[23]	powder	respiratory disorders, headache	anti-allergic, anti-inflammatory, immunomodulatory, analgesic, anti-oxidant	linalool, eucalyptol, isoborneol, α-terpineol, camphor
Pogostemon cablin (Lamiaceae)[24]	powder	fever, headache	anti-allergic, anti-inflammatory, immunomodulatory, antioxidant, analgesic, antibacterial	patchouli alcohol, pogostone, eugenol, α-bulnesene, patchoulene, rosmarinic acid

Table 2: Demographic and clinical characteristics of participants

Characteristics	All patients (n = 30)	Percentage
Age (years, mean ± SD)	20.5 ± 0.63	
Gender		
Male	6	20
Female	24	80
Clinical symptoms		
Congestion	27	90
Discharge	22	73.33
Dyspnea	6	20
Itching	24	80
Sneezing	16	53.33

Table 3: Total nasal symptom score (TNSS) between before and after treatment with traditional Thai herbal formulation (n = 30)

Parameters	Before treatment	After treatment	Median difference (95% CI)	P value
Congestion	3 (3.0)	0 (0)	3 (0 to 3)	< 0.001*
Discharge	3 (0.8)	0 (0)	3 (0 to 3)	< 0.001*
Itching	3 (1.0)	0 (0)	3 (1.45 to 3)	< 0.001*
Sneezing	2 (1.8)	0 (0)	2 (0 to 3)	< 0.001*
Overall	2.3 (1.2)	0 (0.2)	2.3 (1 to 2.8)	< 0.001*

Values are presented as median (IQR).
* Significantly different from baseline at $p < 0.05$.

Essential oil plants exhibit a diverse array of components, primarily monoterpenes, sesquiterpenes, benzenoids, and phenylpropanoids. Numerous pharmacological activities have been shown for the volatile chemicals, involving antioxidant, anticancer, antiprotozoal, antibacterial, anti-inflammatory, phytotoxic, and neuroprotective effects.[25] Essential oils have a multifaceted mechanism of action owing to their diverse composition and may readily access both the upper and lower regions of the respiratory system via inhalation. Furthermore, the antibacterial and anti-inflammatory characteristics of essential oil plants provide an efficacious therapy for respiratory tract illnesses.[26] Notably, the combination of essential oils exhibited enhanced antibacterial efficacy, less toxicity, and produced enhanced anti-inflammatory effects.[27]

Thai herbal formulation inhalation treatment may reduce the concentration of airway secretions by increasing their volume and decreasing their weight of secretions, as well as lowering the maximum airway pressure by diminishing airway stimulation. Additionally, it augmented the secretion of mucous membranes, accelerated gas exchange, and raised the oxygen saturation of patients on mechanical ventilation by directly stimulating the mucosa, boosting airway mucosal secretion, and enhancing the activity and movement of respiratory tract cilia.[28-32] Consequently, inhalation treatment using Thai herbal formulations may be advised to enhance the respiratory tract condition in patients with allergic rhinitis.

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Table 4: Rhinoconjunctivitis quality of life questionnaires (Rcq-36) between before and after treatment with Traditional Thai herbal formulation (n = 30)

Parameters	Before treatment	After treatment	Median difference (95% CI)	P value
Rhinitis symptoms	4.3 (0.5)	1.3 (0.2)	3 (0.9 to 3.8)	< 0.001*
Eye symptoms	3.5 (2.5)	1.3 (0.2)	2.3 (0.8 to 3.5)	< 0.001*
Other symptoms	3 (1.3)	1.1 (0.1)	1.8 (0.3 to 2.5)	< 0.001*
Physical functioning	2.3 (0.7)	1 (0.3)	1.3 (1 to 2.7)	< 0.001*
Role limitation due to physical problem	1.7 (0.3)	1 (0.3)	0.3 (0 to 2)	< 0.001*
Sleep problem	1.3 (2)	1 (0)	0.3 (0 to 3)	< 0.001*
Social functioning	2.2 ± 0.7	1.0 ± 0.1	1.2 (0.9 to 1.4)	< 0.001*
Emotions	2.5 (1.4)	1 (0.2)	1.3 (0.6 to 2.2)	< 0.001*
Overall quality of life[a]	2.9 (1)	1.1 (0.1)	1.8 (0.9 to 2.0)	< 0.001*
Overall health	4 (0)	2 (0)	2 (1 to 2)	< 0.001*

Values are presented as mean ± SD or median (IQR).
[a] The overall quality of life was determined by summing the six domains: symptoms, physical functioning, role limitation due to physical problem, sleep problem, social functioning, and emotions. * Significantly different from baseline at $p < 0.05$.

Table 5: Rhinoconjunctivitis quality of life questionnaires (Rcq-36) categorized by items between before and after treatment with Traditional Thai herbal formulation (n = 30)

Parameters	Before treatment	After treatment	Median difference (95% CI)	P value
Rhinitis symptoms				
Runny nose	5 (0)	1 (0)	4 (0 to 4)	< 0.001*
Itchy nose	5 (1)	1 (0)	4 (0 to 4)	< 0.001*
Stuffy nose	5 (0)	1 (1)	4 (-1 to 4)	< 0.001*
Sneezing	4 (2)	1 (0)	3 (0 to 4)	< 0.001*
Eye symptoms				
Itchy eyes	5 (1)	1 (0)	3 (3 to 4)	< 0.001*
Irritated eyes	3.5 (4)	1 (0)	2 (0 to 4)	< 0.001*
Watery eyes	3 (2)	1 (0)	1 (0 to 3)	< 0.001*
Tired eyes	3.5 (4)	1 (0)	2.5 (0 to 4)	< 0.001*
Other symptoms				
Cough	1 (2)	1 (0)	0 (0 to 2.3)	0.005*
Dry throat/dry mouth	2 (2)	1 (1)	0 (0 to 4)	0.001*
Phlegm	4 (2)	1 (1)	3 (0 to 4)	< 0.001*
Hard to think	3.5 (3)	1 (0)	2.5 (0 to 3)	< 0.001*
Fatigue	3 (3)	1 (0)	2 (0 to 3)	< 0.001*
Tired easily	3 (3)	1 (0)	2 (0 to 3)	< 0.001*
Body aches	3 (3)	1 (0)	2 (0 to 3)	< 0.001*
Headaches	4 (1)	1 (0)	3 (0 to 4)	< 0.001*
Sleepy all the time	2 (3)	1 (0.8)	1 (0 to 3)	< 0.001*
Physical functioning				
Must stop work or studies	1 (0)	1 (0)	0 (0 to 1)	0.072
Unable to concentrate on work or studies	3 (1)	1 (1)	2 (1 to 4)	< 0.001*
Causes a disturbance in work, such as interrupted working	3 (1)	1 (0)	2 (2 to 3)	< 0.001*
Role limitation due to physical problem				
When playing sports or doing a heavy work or participating in an activity that requires a lot of strength or energy	2 (2)	1 (1)	1 (0 to 3)	< 0.001*
When playing sports or having a regular work or participate in an activity that requires average strength or energy	1 (1)	1 (0)	0 (0 to 2)	0.001
When walking half a kilometer	1 (1)	1 (0)	0 (0 to 2)	0.002
Sleep problem				
Sleep and wake up often during the night	2 (2)	1 (0)	1 (0 to 3)	< 0.001*
Difficulty getting to sleep	1 (2)	1 (0)	0 (0 to 3)	0.002*
Do not sleep deeply	1 (2)	1 (0)	0 (0 to 3)	0.002*
Social functioning				
Loss of confidence when meeting others	2 (2)	1 (0)	1 (0 to 2)	< 0.001*
Reduce the meetings or activities with others	2 (1)	1 (0)	1 (0 to 2)	< 0.001*
Feel like you do not want to go out	2 (1)	1 (0)	1 (0 to 3)	< 0.001*
Emotions				
Annoyed with self	3 (1)	1 (0)	2 (1 to 2)	< 0.001*

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Worried	2 (1)	1 (0)	1 (0 to 3)	< 0.001*
Frustrated	2.5 (1.8)	1 (0)	1.5 (0 to 3)	< 0.001*
Irritated	1 (2)	1 (0)	0 (0 to 3)	0.003*
Annoyed to have to carry tissue papers or handkerchief more than usual	3 (1)	1 (1)	1 (1 to 3)	< 0.001*

Conclusion

The findings demonstrated that the Thai herbal formulation comprising *A. ascalonicum*, *C. hystrix*, *C. citratus*, *Z. officinale*, *A. concinna*, *S. indicum*, *C. camphora*, and *P. cablin* was significantly effective in ameliorating overall nasal symptoms and improving the quality of life associated with rhinoconjunctivitis in the treatment of persistent allergic rhinitis. This research represents a potential supplementary approach for the appropriate application of selected medical combinations in the therapy of persistent allergic rhinitis.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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