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Case Series

Effect of peppermint oil steam inhalation on pulmonary function in patients with bronchial asthma: a case series

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ABSTRACT

Asthma is a chronic inflammatory disorder characterized by airway inflammation, airflow restriction, and bronchial hyperresponsiveness. Conventional treatments for asthma, though effective, often come with side effects, creating a demand for complementary therapies. Peppermint oil, known for its anti-inflammatory and bronchodilatory properties, has not been previously studied for its effects on asthma patients. This study explores impact of peppermint oil steam inhalation on pulmonary function in patients with bronchial asthma. This case series included three asthma patients (ages 19-24 years) with varying severity of asthma. Each participant received daily steam inhalation with peppermint oil for 7 days using a facial sauna. Pulmonary function tests (PFT) were conducted using spirometry to measure forced vital capacity (FVC), forced expiratory volume in first second (FEV1), FEV1/FVC ratio, peak expiratory flow rate (PEFR), and forced expiratory flow (FEF 25-75%) before and after intervention. Peppermint oil steam inhalation improved pulmonary function in all cases: Case 1: FVC increased from 92-105%, FEV1 from 91-105%, and PEFR from 86-109%. Case 2: FVC increased from 97-102%, FEV1 from 87-95%, and PEFR from 89-92%. Case 3: FVC increased from 90-94%, FEV1 from 78-84%, and PEFR from 74-79%. This case series suggests that peppermint oil steam inhalation can improve pulmonary function in asthma patients, offering a potential complementary therapy. Larger studies with extended follow-up are needed to validate these findings.

Keywords: Bronchial asthma, Peppermint oil, Steam inhalation, Pulmonary function

INTRODUCTION

Asthma is a common, chronic inflammatory respiratory disorder worldwide. It is characterized by airway inflammation, resulting in intermittent airflow restriction and bronchial hyperresponsiveness.[1] according to the most recent global burden of disease (GBD, 1990-2019) estimates, the total burden of asthma in India is 34.3 million, accounting for 13.09% of the global burden. It also said that there were 13.2 per thousand deaths caused by asthma in India to alleviate symptoms and prevent exacerbations, chronic asthma patients are treated with a

variety of drug types.[2] These include beta-2 agonists, anticholinergics, low-dose inhaled corticosteroids, medium-dose inhaled corticosteroids, high-dose inhaled corticosteroids, inhaled long-acting beta-agonists, leukotriene receptor antagonists, theophylline, cromolyn, zileuton, and newer monoclonal antibody immune-modulating drugs. Oral corticosteroids may be utilized in the acute phase of asthma exacerbations. Side effects of these medications include tremors, insomnia, nervousness in children, sweating, chills, and dyspepsia.[3] hence, there is a need for complementary and alternative medicine. Naturopathy is a sort of primary care medicine that combines age-old healing practices with scientific advancements and contemporary studies. It is guided by a distinct set of concepts that acknowledge the body's natural healing power, prioritize disease prevention, and promote individual responsibility for achieving maximum health.[4] previous studies on aroma inhalation with a mixture of eucalyptus, lemon, lavender, peppermint and tea tree for day treatment and a blend of lavender and ylang-ylang for night treatment have shown to reduce sore throat and fatigue in COVID-19 patients which would also be associated with bronchial asthma and inhalation of *Mentha spicata* and *Citrus sinensis* improve lung function and exercise performance in male athletes.[5-7] no studies have documented the effects of peppermint oil steam inhalation on pulmonary function in patients with bronchial asthma. Hence, we intend to find the effects of peppermint oil steam inhalation on pulmonary function in patients with bronchial asthma.

CASE SERIES

Case 1

A 24-year-old female presents with a history of mild, persistent asthma, diagnosed at age 10. She reports occasional wheezing and shortness of breath, primarily during exercise; however, her symptoms are generally well-controlled with infrequent use of her rescue inhaler (albuterol). She is 165 cm tall and falls within the normal range. On general examination, she appears well-nourished and in no acute distress, with stable vital signs and oxygen saturation at 98%. Systemic examination reveals mild wheezing during expiration but no accessory muscle use or retractions.

Case 2

A 19-year-old male with moderate persistent asthma, diagnosed since childhood, has a height of 154 cm and weighs 49 kg, resulting in a BMI of 20.4. He reports a daily cough and nighttime wheezing that disrupts his sleep, with increased reliance on albuterol, using it 2-3 times per week. He appears slightly anxious but is not in acute distress. Vital signs are stable, with a respiratory rate of 18 breaths per minute and oxygen saturation at 95% on room air. Systemic examination reveals moderate wheezing bilaterally, with no signs of respiratory distress.

Case 3

A 19-year-old female with a known history of bronchial asthma presents for evaluation. She is 156 cm tall and weighs 59 kg, resulting in a body mass index (BMI) of 24.5. Upon examination, her vital signs reveal a respiratory rate of 20 breaths per minute, a heart rate of 76 beats per minute, and oxygen saturation of 95% on room air. General examination shows a well-nourished individual. A systemic examination of the respiratory system revealed no wheezing, and normal vesicular breath sounds were heard. No signs of retractions or cyanosis are noted.

Assessments

PFT was conducted using the RMS Helios 401 device. Calibration was performed before the assessment, which was done in a seated position. A minimum of three trials were conducted, and the best of these readings was used for analysis. Spirometry was used to assess FVC, FEV1, the ratio of FEV1 to FVC (FEV1/FVC), PEFR, and mean forced expiratory flow during the middle half of FVC (FEF 25-75%).[8] Baseline measurements were taken on day 1 before the intervention, and post-assessment measurements were recorded on day 7.

Intervention

Patients underwent daily steam inhalation using an electric facial steamer at a temperature around 104 - 108ºF. The steamer was filled with water in a graduated container, and 3-5 drops of peppermint oil were added. Participants were seated comfortably, and the steamer was placed on a table in front of them at a distance of 30 cm. They were instructed to lean forward, position their face over the steamer, and inhale the peppermint-infused steam for 5 to 10 minutes each morning. This process was repeated for 7 consecutive days. Care was taken to ensure the temperature of the steam was comfortable to avoid any discomfort or burns.

Facial steam with peppermint oil for 5-10 minutes daily in the morning for 7 days improved pulmonary function in patients with bronchial asthma. Case 1: FVC (L/min) from 92% to 105%, FEV1 (L/min) from 91% to 105 %, FEV1/FVC ratio from 100%to 100%, FEF (25-75%) (L/min) from 76% to 85%, and PEFR (L/Sec) from 86% to 109% (Table 1 and Figure 1).

Case 2: FVC (L/min) from 97% to 102%, FEV1 (L/min) from 87% to 95%, FEV1/FVC ratio from 90% to 93%, FEF (25-75%) (L/min) from 54% to 62%, and PEFR (L/Sec) from 89% to 92% (Table 2, Figure 2).

Case 3: FVC (L/min) from 90% to 94%, FEV1 (L/min) from 78% to 84%, FEV1/FVC ratio from 86% to 90%, FEF (25-75%) (L/min) from 49% to 56%, and PEFR (L/Sec) from 74% to 79% (Table 3 and Figure 3).

Table 1: Pulmonary function test parameters before and after intervention in case 1.

Parameters	Predicted level	Before pre	%PRED	After post	% PRED	IMP
FVC	2.77	2.54	92	2.91	105	+15
FEV1	2.42	2.21	91	2.54	105	+15
FEV1/ FVC%	87.36	87.01	100	87.29	100	+00
FEF 25-75	3.41	2.59	76	2.89	85	+12
PEFR	5.60	4.80	86	6.13	109	+28

PRED-predicted value; IMP-improvement; FVC-forced vital capacity; FEV1-forced expired volume in the first second; FEV1/FVC-forced expiratory volume in the first second and forced vital capacity ratio; FEF-forced expiratory flow; PEFR-peak expiratory flow rate.

Table 2: Pulmonary function test parameters before and after intervention in case 2.

Parameters	Predicted level	Before pre	%PRED	After post	% PRED	IMP
FVC	3.00	2.90	97	3.07	102	+06
FEV1	2.62	2.28	87	2.49	95	+09
FEV1/ FVC%	87.33	78.62	90	81.11	93	+03
FEF 25-75	3.59	1.93	54	2.21	62	+15
PEFR	5.86	5.19	89	5.37	92	+03

PRED-predicted value; IMP-improvement; FVC-forced vital capacity; FEV1-forced expired volume in the first second; FEV1/FVC-forced expiratory volume in the first second and forced vital capacity ratio; FEF-forced expiratory flow; PEFR-peak expiratory flow rate.

Table 3: Pulmonary function test parameters before and after intervention in case 3.

Parameters	Predicted level	Before pre	%PRED	After post	% PRED	IMP
FVC	3.15	2.85	90	2.95	94	+04
FEV1	2.76	2.15	78	2.33	84	+08
FEV1/ FVC%	87.62	75.44	86	78.98	90	+05
FEF 25-75	3.63	1.77	49	2.04	56	+15
PEFR	6.05	4.48	74	4.80	79	+07

PRED-predicted value; IMP-improvement; FVC-forced vital capacity; FEV1-forced expired volume in the first second; FEV1/FVC-forced expiratory volume in the first second and forced vital capacity ratio; FEF-forced expiratory flow; PEFR-peak expiratory flow rate.

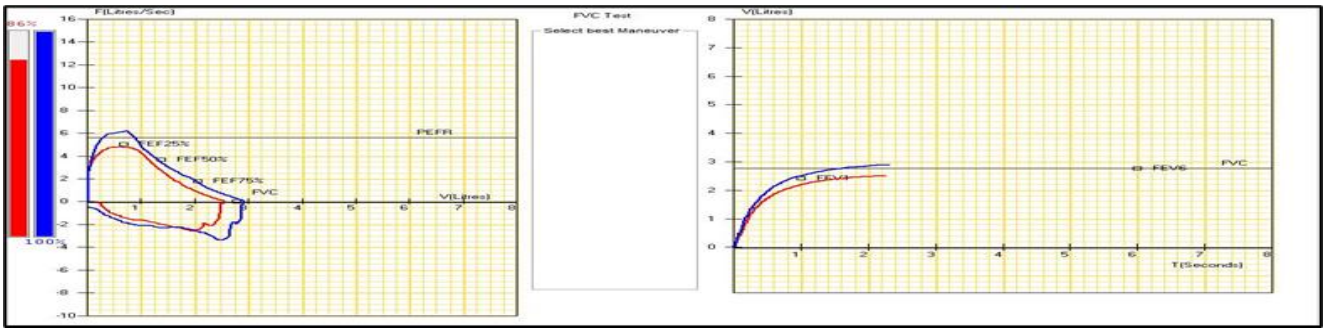

Figure 1: Effect of facial steam on pulmonary function test in case 1. Red-pre-test; blue-post-test.

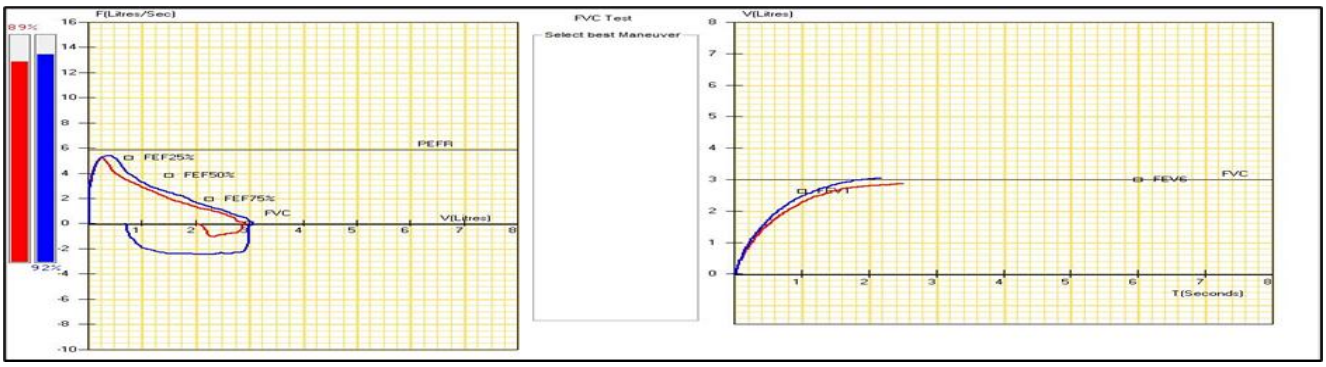

Figure 2: Effect of facial steam on pulmonary function test in case 2. Red-pre-test; blue-post-test.

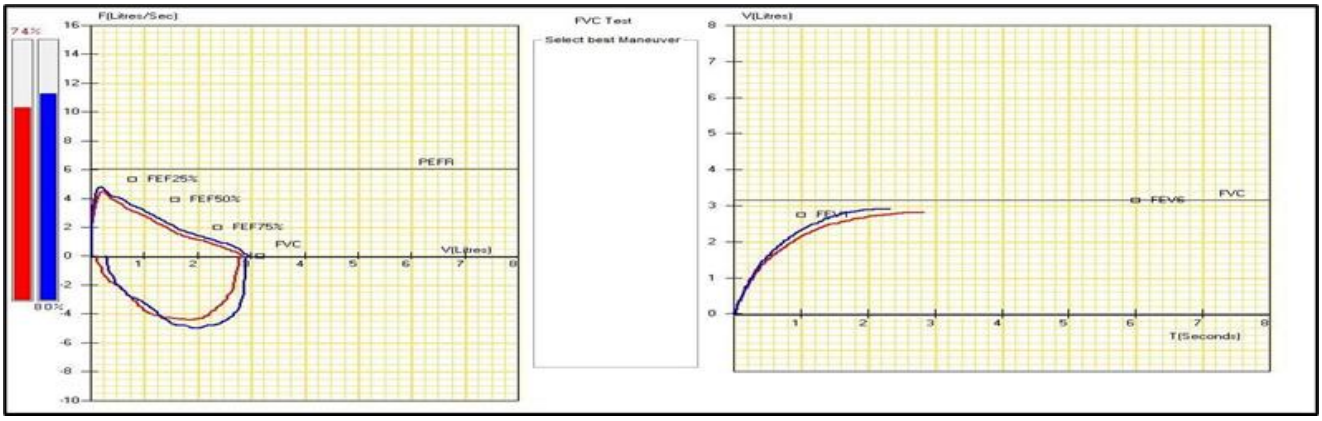

Figure 3: Effect of facial steam on pulmonary function test in case 3. Red-pre-test; blue-post-test.

DISCUSSION

This is the first-ever study to explore the effects of peppermint oil steam inhalation in patients with bronchial asthma. The results show that peppermint oil steam inhalation has improved the lung function of bronchial asthma patients. The result would be attributed to the following mechanisms. Inhaling humid and heated air raises the temperature of the nasal mucosa, inhibiting chemical production from mast cells in allergic rhinitis or the common cold.[9] Inhalation of steam stresses the lungs. Due to heat-induced stress, the lungs' breathability is improved by lowering pulmonary congestion and increasing tidal volume, vital capacity, airflow, and forced expiratory lung volume.[10] Inhaling hot air boosts the immune system's first line of defence by directly blocking or disabling virions in the body's primary airways where they first penetrate, and it also facilitates mucociliary clearance, which can be further strengthened by steam inhalation.[11] A previous study done by Ilpo Kuronen et al stated that steam inhalation acts as low workload respiratory training, improved the vital capacity in stable asthmatic patients through increasing the respiratory muscle power, which is in line with the present findings.[12]

Peppermint essential oil, which is mostly composed of menthol, menthone, neomenthol, and iso-isomenthone, is a blend of volatile metabolites with anti-inflammatory, antibacterial, antiviral, immunomodulatory, anticancer, neuroprotective, antifatigue, and antioxidant properties.[13] Peppermint oil inhalation may reduce epithelial remodeling and inflammation in asthma through modulation of the interleukin-6/Janus kinase 2 (JAK2)/signal transducer and activator of transcription 3 (STAT3) [IL-6/JAK2/STAT3] signaling pathway. Thus, helps in treating asthma.[14] Peppermint oil also reduces carbachol-induced muscle contraction involving autonomic ganglia, and has anti-inflammatory, antispasmodic, and analgesic properties, particularly in respiratory disorders.[13,15] Menthol reduces the production of key inflammatory mediators, such as leukotriene B4, prostaglandin E2, and interleukin-β2, leading to decreased airway wall thickness, lower mucus secretion, and relief of bronchoconstriction.[16] Thus, these combined effects of steam inhalation and peppermint oil would have contributed to improvement in the pulmonary functions of bronchial asthma patients through a mild bronchodilatory effect by relaxing the smooth muscles of the airways, which can lead to temporary relief of bronchoconstriction and improved airflow.

Patient perspectives

All three participants expressed satisfaction with the peppermint oil steam inhalation intervention. They reported subjective improvements in breathing ease, reduction in wheezing episodes, and enhanced comfort during daily activities. No discomfort or adverse effects were experienced, and all participants indicated willingness to incorporate the therapy into their ongoing asthma management.

Strengths and limitations

This is the first study to examine the effect of steam inhalation with peppermint oil on enhancing pulmonary function in BA patients. No adverse effects were recorded during or after the study. The limitations include a limited sample size and the lack of post-intervention follow-up. Future studies with robust study designs and larger sample sizes are needed to validate the results and efficacy of the therapy.

CONCLUSION

This case series provides initial evidence that peppermint oil steam inhalation can improve pulmonary function in bronchial asthma, offering a safe, accessible, and low-cost option alongside standard care. By demonstrating measurable spirometry improvements after a short intervention, it highlights the potential therapeutic value of combining steam inhalation with the anti-inflammatory and bronchodilatory effects of peppermint oil, warranting larger controlled trials to confirm efficacy and assess long-term outcomes.

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