

## The effect of *Dhumapana* with *Devadarwadi Dhuma Varti* on Pulmonary function in healthy volunteer- A Case study

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### Abstract

This case study assesses the effect of a 30-day programme of *Dhumapana* (medicated fume inhalation) using *Devadarwadi Dhuma Varti* on the pulmonary function of a 22-year-old healthy male. Before the procedure, the subject's baseline clinical and pathological parameters were within the normal limits. Spirometry assessments were conducted before and after the intervention which indicated that there were significant improvements in key respiratory parameters. PEFR had increased by 66%, FEV<sub>1</sub> by 52%, and FVC by 71%. Interestingly, the FEV<sub>1</sub> /FVC ratio had dropped by 11%, approaching the normal range. These alterations point to greater expiratory flow, increased lung capacity, and less airway blockage suggesting the potential efficacy of this Ayurvedic *Dhumapana* in enhancing lung function. However, further large-scale clinical studies are essential to establish the safety and efficacy of *Dhumapana* in the masses.

**Key words :** *Dhumapana*, *Devadarwadi Varti*, Spirometry, Pulmonary Function, Ayurveda

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**Dhumapana** (medicated fume inhalation) is an ancient ayurvedic procedure which is generally used to prevent or treat the diseases of supraclavicular regions, specially *Kaphaja* and *Vataja* conditions.<sup>5</sup> Apart from this, it is also indicated in healthy individual as a part of *dincharya* (daily regimen) for keeping the *doshas* in a balanced state.<sup>5</sup> Although, textual references of *Dhumapana* are available in Ayurvedic classics, but the procedure needs to be validated in the modern times when the pulmonary health of the individuals have decreased considerably as a result of air pollution<sup>15</sup>, acute and chronic respiratory conditions like Covid<sup>1</sup> and COPD<sup>15</sup>.

One of the most fundamental and popular pulmonary function tests (PFTs) is spirometry, which determines the amount and flow of air during inhalation and expiration. Hence, it is used for assessment of lung function and for diagnosis and management of several respiratory conditions, including asthma, chronic obstructive pulmonary disease (COPD), and restrictive lung illnesses.<sup>8</sup> The following are the test's primary parameters:

- **Forced Vital Capacity (FVC):**  
The total amount of air that can be forcefully expelled from the lungs after a maximum inhalation. It is used to detect restrictive lung diseases and shows the lungs' capacity.
- **Forced Expiratory Volume in One Second (FEV<sub>1</sub>):**  
The volume of air exhaled during the first second of the FVC manoeuvre. It indicates lung function and airway blockage.
- **FEV<sub>1</sub> /FVC Ratio:** The percentage of the lung's entire capacity that is expelled during the first second of a forced expiration.

While a normal or high ratio with a low FVC indicates restrictive patterns, a lowered ratio is suggestive of obstructive lung disorders.

- **Peak Expiratory Flow Rate (PEFR):** The maximum flow rate reached during a forced expiratory manoeuvre. It measures airways' quality and airway flow strength and is frequently used to keep an eye on respiratory diseases like asthma.<sup>6</sup>

This case study intends to see the effect of *Dhumapana* in a healthy individual by examining the effects of a 30-day regimen of *Dhumapana* with *Devadarwadi Varti* on spirometry parameters.

#### *Patient Information :*

The subject was a 22-year-old healthy male with no history of respiratory or systemic illnesses. He had no relevant family and genetic history.

#### *Clinical Findings :*

Comprehensive baseline assessments, including vital parameters (blood pressure, heart rate, oxygen saturation) and pathological investigations such as complete blood count (CBC), random blood sugar (RBS), and urine routine and microscopic examination, were performed to check the subject's health status. All parameters were within normal limits at the time of enrolment.

#### *Diagnostic Assessment :*

Routine CBC, RBS, Urine Routine and microscopic and vitals examination were all within normal limits.

*Timeline:*

| Timeline              | Procedures Done                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------|
| 31/07/2023            | Subject informed about the study                                                                    |
| 4/08/2023             | Subject enrolled after informed consent and baseline investigations                                 |
| 15/08/2023            | Spirometry performed and the subject was given <i>Dhumapana</i> with <i>Devadarvadi Dhoomavarti</i> |
| 16/08/2023-12/09/2023 | <i>Dhumapana</i> Continued                                                                          |
| 13/09/2023            | Spirometry performed after <i>Dhumapana</i>                                                         |

*Therapeutic Intervention :*

- A) Type:** Preventive intervention which was *Dhumapana* with *Devadarvadi Dhooma varti*.
- B) Administration:** 3 puffs from each nostril and 3 puffs from mouth twice a day after food for 30 days.

*Preparation of Dhoomavarti :*

The source of reference for the *Devadarvadi Dhoomavarti* was *Bhavaprakash Swasa chikitsa adbhikara*. The components of the *Dhumavarti* are-

1. *Devadaru - Cedrus deodara*
2. *Jatamansi - Nardostachys Jatamansi*
3. *Bala - Sida cordifolia*<sup>10</sup>

Following steps were performed to prepare the *Dhumavarti*.<sup>7</sup>

- *Ikshika* (hollow reed) of 24 cm was soaked overnight in water.
- Cotton cloth of 16\*16 cm was well rinsed in hot water and dried.

- *Kalka* (Paste) prepared from the drugs was applied onto the flatly laid cloth.
- The *ikshika* was then positioned at one end of the cloth and rolled and placed in the shade to dry completely.
- A *Varti* was then obtained from this process.

*Method of Administration*<sup>9</sup>:

- The subject was seated erect on a knee-high chair, looking forward, with eyes closed and asked to focus on the procedure and to avoid distractions.
- A straight, conical clay chillum (pipe) with an end-to-end channel was wrapped with a cloth at the mouth to act as a filter.
- *Dhumavarti* soaked in ghee overnight was then inserted into the chillum and then lit.
- The smoke produced from it was asked to be inhaled as follows:
  - ✓ The subject was asked to close the right nostril with the right index finger and inhale smoke through the left nostril and exhale through mouth.
  - ✓ The procedure was repeated three times for the left nostril.
  - ✓ The procedure was then switched to the right nostril by closing the left nostril with the left index finger and was repeated for three times.
  - ✓ When the sputum was produced it was asked to be expelled.
  - ✓ The subject was advised to rest after the procedure for several minutes before resuming routine activities.
  - ✓ Pathya (do's) and Apathya (don'ts) was explained after the procedure.

- ❑ **Note-** The fume inhaled was strictly exhaled from the mouth irrespective of route of inhalation.

*Follow-up :*

The patient was asked to come for a follow-up on 30<sup>th</sup> day of the intervention where he was asked to perform a spirometry test

- **Spirometry Assessment:** Pulmonary function was evaluated using a standardized spirometer to measure key

parameters:

- Forced Vital Capacity (FVC)
- Forced Expiratory Volume in 1 second (FEV1)
- FEV1/FVC ratio
- Peak Expiratory Flow Rate (PEFR)

Spirometry tests were conducted at baseline (Day 1) and after the intervention (After 30 days). The procedures adhered to the American Thoracic Society's guidelines for reproducibility and acceptability to ensure reliable measurements.

*Outcomes :*

The spirometry results before and after the intervention are as follows:

| Parameter    | Baseline (Day 1)<br>(in %) | Post- Intervention<br>(After 30days)<br>(in %) | Percentage<br>Improvement | Normal Value <sup>6</sup> |
|--------------|----------------------------|------------------------------------------------|---------------------------|---------------------------|
| FVC          | 89                         | 152                                            | +71%                      | >80%                      |
| FEV1         | 84                         | 128                                            | +52%                      | >80%                      |
| FEV1/FVC (%) | 95                         | 84                                             | -11%                      | 70-80%                    |
| PEFR         | 41                         | 68                                             | +66%                      | >=80                      |

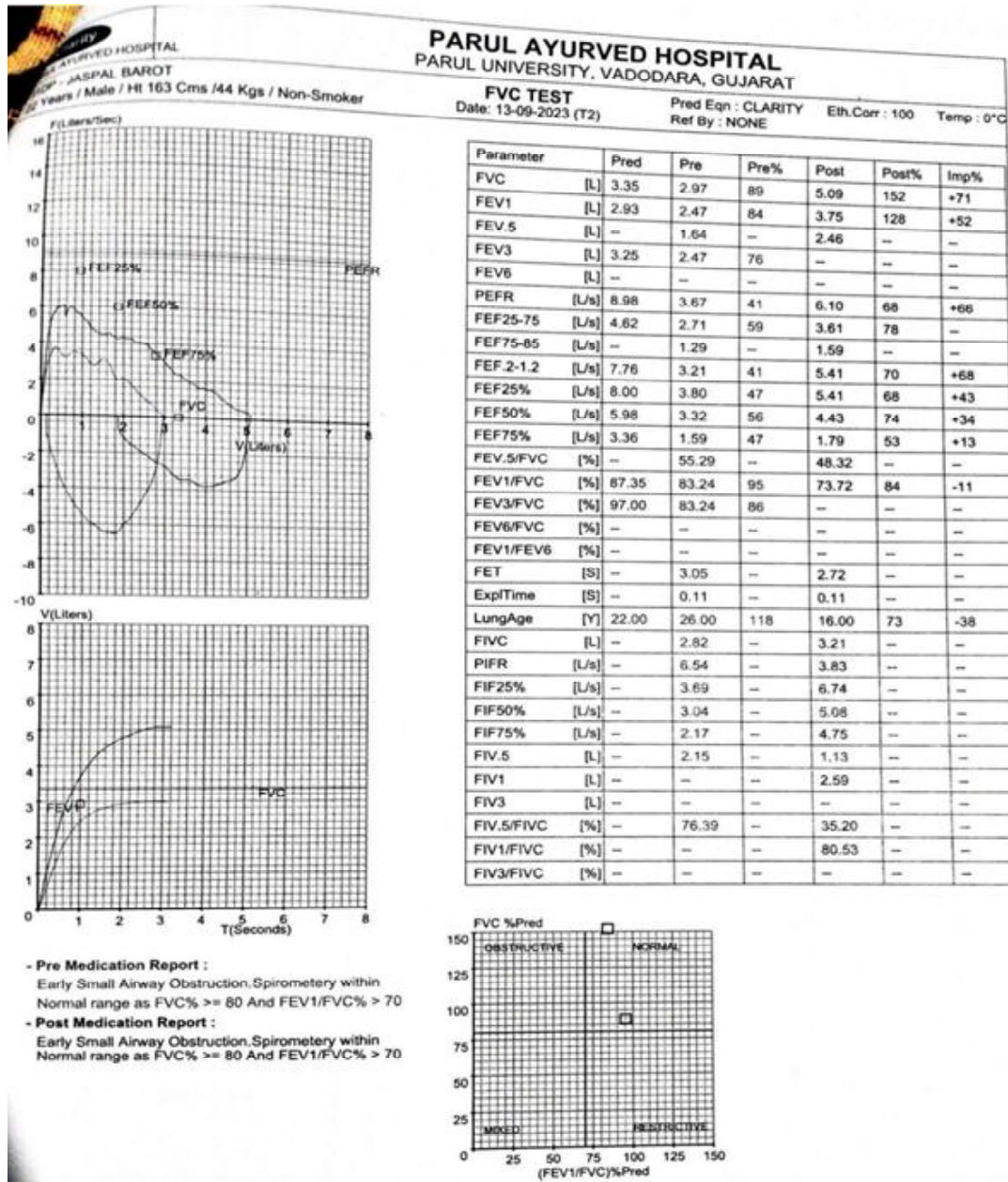
The results show substantial improvements in most of the pulmonary function parameters. Improvements are particularly seen in Forced Vital Capacity (FVC) and Peak Expiratory Flow Rate (PEFR), which increased by more than 71% and 66%, respectively. However, a reduction of 11% in the FEV1/FVC ratio was observed. Although the reduction in this case brings down the value nearer to the normal range, this decrease may require further investigation to understand its clinical significance.

Overall, the findings indicate a positive impact of the *Dhumapana* regimen on pulmonary function, with notable improvements in lung

capacity and expiratory flow rates.

*Spirometry Report :*

*Dhumapana* is not only indicated in the diseased state but can also be practiced as a daily regimen to keep the three *doshas* in a *balanced* state which in turn ensures a healthy body. Although explicitly mentioned about its advantages in our classical Ayurvedic textbooks by our acharyas, *Dhumapana* is however often forced to be neglected by the clinicians as it is often looked down upon due to being compared to tobacco smoking. Hence to re-establish the reputation of this procedure it is necessary to create awareness among



patients about *Dhumapana* and how it is different from the regular tobacco smoking practices. For this, it is very important to

establish the fact about the safety of the procedure which this study is trying to carry out by conducting a case study to assess the

spirometry of a subject before and after *Dhumapana* procedure. Thus, with the intention to establish the safety of *Dhumapana*, the drugs *Jatamansi* (*Nardostachys jatamansi* (D. Don) Dc ), *Devadaru* (*Cedrus deodara*) and *Bala* (*Sida cordifolia* L.) were used.

*Devadaru* (*Cedrus deodara* (Roxb.) G. Don) is having *Tikta* (Bitter) *rasa* (taste), *Laghu* (light), *Snigdha* (Unctuous) *guna* (property), *Ushna Virya* (Hot Potency), *Katu* (Pungent) *Vipaka* (Metabolic transformation) with *Vatahara* (Subsides vitiated Vata), *Kaphahara* (Subsides vitiated Kapha) Property. It resolves inflammation, acts as an expectorant and has anti allergic properties. Traditionally it is used in the cases of *Kasa* (Cough), *Hikka* (Hiccups) which shows its action on respiratory system.<sup>9</sup>

*Jatamansi* (*Nardostachys jatamansi*) is said to have *Tikta* (Bitter), *Kashaya* (Astringent) *rasa* (taste), *Laghu guna* (light property), *Sheeta Virya* (Cool Potency), *Katu* (Pungent) *Vipaka* (Metabolic transformation) with tridoshaghna (Balances all the three doshas) property. Traditionally along with other uses it has also been used in the cases of *kasa* (cough), *swasa* (respiratory disorders) and *hikka* (hiccup) showing its effect on the respiratory system.<sup>4</sup>

Whereas *Bala* (*Sida cordifolia*) has *Madhura* (Sweet) *rasa* (taste), *Laghu* (light), *Snigdha* (Unctuous), *Picchila* (Sticky) *guna* (property), *Sheeta Virya* (Cool Potency), *Madhura* (Sweet) *Vipaka* (Metabolic transformation). It is described as *Tridoshhara* (Balances all the three doshas) in Dhanwantari and Kaiyadeva Nighantu in relation to its *Karma* (action) on *Doshas* whereas Priya

Nighantu and *Kaphanashaka* (Subsides Kapha) in Raj Nighantu, and *Vatapittahara* (subsides *Vata* and *Pitta*) in Bhavprakash. Traditionally it is used in various preparations which also includes the preparations to treat cases of *Kasa* (cough), *Hikka* (hiccup) which also shows its action on respiratory system.<sup>14</sup> Hence it is safe to say that all the three drugs used in this study has some actions on the respiratory system of the individual. Hence the pharmacological actions of the components in *DevadarwadiVarti* may be responsible for the notable improvements in spirometry parameters as seen in this study. More studies have shown these herbs to possess the effects of bronchodilator, expectorant, and anti-inflammatory on the respiratory system.

*Effect of Devadarwadi Dhoomavarti on spirometry parameters :*

*FVC and FEV1 :*

A low FVC can be result of insufficient patient effort, limits in airflow, or illnesses that affect the pleura, thoracic cage, or lung parenchyma whereas airway inflammation, bronchospasm-induced airway blockage, loss of lung elasticity, and increased secretions may be main reasons of reduced FEV1. According to modern ERS/ATS interpretation criteria, a rise in FEV1 or FVC of at least 10% of the corresponding anticipated values is considered a substantial bronchodilator response. In this study, the percentage of FVC was observed to be improved by +71% while FEV1 % was increased by +52% which shows reduction in airway obstruction, improved airflow and positive bronchodilator effect.<sup>2,11</sup>

*FEV<sub>1</sub>/FVC Ratio :*

FEV<sub>1</sub>/FVC is essential for detecting airflow obstruction. It is used to diagnose obstructive or restrictive lung diseases. FEV<sub>1</sub>, FVC, and total lung capacity are reduced in restrictive disorders (such as Asthma and Chronic Obstructive Pulmonary Disease), leading to a normal or elevated FEV<sub>1</sub>/FVC ratio.<sup>2</sup> In this study, it is observed that the initial FEV<sub>1</sub>/FVC ratio of 95% is reduced to 84% which falls under the normal range of 70% - 80% showing its efficiency in reducing airway obstruction. It may indicate that the lungs are adapting to a larger volume of air due to this procedure. This observation warrants further investigation, particularly in understanding how *Dhumapana* (medicated fume inhalation) affects lung mechanics over longer periods.

*PEFR% :*

Peak Expiratory Flow Rate (PEFR) gives an assessment of airway competence and airflow limitation. It is mainly used to evaluate asthma control and managing aggravations. An improvement in PEFR signifies enhanced airway patency, reduced obstruction, and improved respiratory efficiency. The observed increment in PEFR of +66% in this study highlights its efficacy in improving airflow and overall respiratory health<sup>3</sup>.

*Mechanisms of Action :*

The *Sookshma* (Subtle) and *Vyavayi* (Spreading and penetrating) properties of medicated *Dhuma* (fumes) which is generated and powered by the elemental dominance of *Agni* (fire) and *Vayu* (air) enable the rapid delivery and deep penetrations of the fumes

into the *Srotas* (intricate channels) of the head and neck thus increasing its therapeutic effects. The gaseous nature of the medicated fume increases their bioavailability in the large surface area of the lungs and the pressure variations during inhalation promotes its absorption into the bloodstream.

The procedure of *Dhumapana* involves taking three inhalations of smoke, which enhances the interaction between the fumes and the respiratory mucosa. This method increases the absorption of the drug to the maximum level and delivers it to both localized and systemic routes. Locally, the *Ushna* (hot) and *Tikshna* (sharp) properties of the fumes along with the properties of the drugs, liquefy and facilitate the removal of vitiated *Kapha* and *Vata doshas* through natural routes of elimination like nasal discharge or sputum. Systemically, the active components are circulated through the bloodstream, hence achieving widespread therapeutic benefits.

Furthermore, the *Sookshma Guna* (Subtle property) of the fumes ensures their ability to reach even the finest channels, clearing obstructions and promoting detoxification. This complies with the principle of *Srotoshodhana* (channel cleansing) and effectively addresses *dosha* imbalances. Combining these understandings with the physiological principles of medicines in gaseous form, *Dhumapana* may provide a thorough and effective treatment strategy<sup>12,13</sup>.

*Limitations and Future Directions :*

Despite getting the better results, the lack of a control group and small sample size are two of the study's flaws that restrict how

far we can apply the findings. It is better to have larger cohorts, randomized controlled trials, and long-term follow-ups for future studies to evaluate *Dhumapana*'s long-term effects. In order to comprehend any possible adverse effects, it is also necessary to investigate the mechanisms underlying the decline in the FEV<sub>1</sub>/FVC ratio. However further large-scale studies with bigger populations are required to validate these results and investigate the wider uses of *Dhumapana* in diseases of Supraclavicular region and respiratory health management, to establish its efficacy.

Through this study it may be concluded that *Dhumapana* with *Devadarwadi Dhumavarti* may be used as a non-invasive method to improve lung function in healthy people.

#### **Conflict of Interest :**

There is no conflict of interest about the publication of this article.

#### **Patient Perspective :**

The subject expressed satisfaction with the intervention. He reported feeling more energetic than before at the end of the intervention and felt lightness of the head and body. He felt more happier than before and had more sound sleep than before. He expressed interest in following ayurvedic practices in the future.

#### **Informed Consent :**

Informed consent was obtained from the subject prior to the study. The protocol was reviewed and approved by the institutional ethics committee. Potential risks associated with the use of *Dhumapana* were discussed

with the subject, and necessary precautions were taken to ensure safety during the intervention.

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