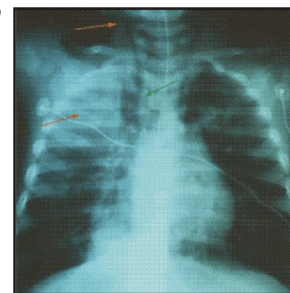


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# BRONCHIAL ASTHMA; EFFECT OF ADHATODA VESICA ON AIRWAY RESPONSIVENESS WITH PULMONARY FUNCTION TESTS



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**ABSTRACT ...** [chaudry@cyber.net.pk](mailto:chaudry@cyber.net.pk) **Objectives:** 1) To study and compare the Pulmonary Function Tests (PFTs) in middle-aged non-smoker, non-asthmatic males with non-smoker mild asthmatics. 2) To provide a scientific basis for choice of herbal medicines as bronchodilator for asthmatic patients by standardized PFTs. **Setting:** Punjab Post-graduate Medical Institute (PGMI), Lahore, Out-Patient Departments of Services Hospital and Asthma Clinic Mayo Hospital, Lahore. **Patients & Methods:** Forty male nonsmokers between 30 - 60 years of age, equally divided into control & mild asthmatic groups. PFTs were carried out with Body Plethysmograph (Model 2.2 PK Morgan, UK) before & after administration of the herbal medicine. The baseline value of Forced Expiratory Volume in first second (FEV<sub>1</sub>) was used as an index for sub-clinical hyper-responsive behavior of asthmatic group. Reversibility was defined as improvement in FEV<sub>1</sub> of 15% or more from baseline after intake of the bronchodilator. Spirometric and volume related parameters were measured. The response of asthmatic group was compared with control group before and after intake of Adhatoda Vasica. **Results:** There was a statistically significant difference ( $p < 0.05$ ) in the baseline values of FEV<sub>1</sub>, FEV<sub>1</sub>%, Forced Expiratory Flow 25~75% (FEF 25~75%), Peak Expiratory Flow Rate (PEFR), Thoracic Gas Volume (TGV), Total Lung Capacity (TLC) and Airway Resistance (Raw) amongst asthmatic and control groups. Whereas the difference became non-significant ( $p > 0.05$ ) after the intake of herbal medicine except for FEV<sub>1</sub> which showed a significant difference ( $p < 0.05$ ). The post-bronchodilator percent change in FEV<sub>1</sub> was highly significantly ( $p < 0.01$ ) correlated with percent changes in FVC, PEFR, TGV, TLC and Raw. **Conclusion:** This study reveals that flow rates and static lung volumes are helpful in assessing reversibility in airway obstruction after intake of bronchodilators.

**Key Words:** PFTs, Bronchial asthma, Bronchodilators, Adhatoda Vasica

## INTRODUCTION

Asthma is characterized by variable degree of airway obstruction and increased bronchial sensitivity to several

specific and non-specific stimuli<sup>1</sup>. Air-flow obstruction in bronchial asthma is partially or completely reversible either spontaneously or with appropriate therapy<sup>2</sup>. Pulmonary Function Tests (PFTs) provide objective and

quantifiable measure of lung functions<sup>3</sup>.

An assessment of reversibility is a part of diagnostic evaluation of patients with asthma after administration of a bronchodilator<sup>4</sup>. Reversibility is defined as a change in Forced Expiratory Volume in first second (FEV<sub>1</sub>) of 15% or greater from baseline value<sup>5</sup>. In bronchial asthma bronchodilators, mucolytic agents and muscle relaxants of herbal origin have been used since centuries in Indian indigenous medicine<sup>6</sup>.

Adhatoda Vesica, a shrub has considerable reputation as an expectorant and anti-spasmodic<sup>7</sup>. The roots and leaves of Adhatoda Vesica have beneficial effect in asthma and bronchitis as shown by Lahiri and Pradhan<sup>8</sup>. Vasicine is an alkaloid derived from its fruit, leaves and roots which produces slight but persistent bronchodilatation<sup>9</sup>.

### AIMS & OBJECTIVES

- \* To study and compare the PFTs in middle-aged non-smoker, non-asthmatic males with non-smoker mild asthmatics.
- \* To study and assess the response to Adhatoda Vesica in all these subjects.
- \* To provide a scientific choice basis for herbal medicines as bronchodilator for asthmatic patients by standardized PFTs.

### MATERIAL & METHODS

In this study, 40 male non-smokers between 30 to 60 years of age were included and divided into Control & Mild Asthmatic groups.

#### Control Group (20 cases)

Subjects selected by simple random technique from students and staff of Punjab Post-graduate Medical Institute (PGMI), Lahore.

#### INCLUSION CRITERIA:

- \* No structural deformity of thoracic cage,
- \* No respiratory infection for at-least three months prior to testing,

- \* No history of wheeze,
- \* baseline FEV<sub>1</sub> above 80% of the predicted value.

#### Mild Asthmatic Group (20 cases)

Selected from out-patient departments of Services Hospital and Asthma Clinic Mayo Hospital, Lahore.

#### INCLUSION CRITERIA<sup>10</sup>

1. Asthmatics having infrequent episodes of cough and wheeze with long symptom-free periods,
2. Subjects having mild disease with some daily symptoms controlled by inhaled bronchodilator
3. Subjects having baseline FEV<sub>1</sub> above 60% of the predicted value.

None of the subjects had any other cardio pulmonary disease as assessed by detailed history, physical examination, chest radiography and electro-cardiography.

PFTs were carried out with Body Plethysmograph (Model 2.2 PK Morgan, UK ) having pneumo-tachograph. The equipment was fully calibrated daily before starting the tests.

After subject selection, age in years, weight in kilograms and standing height to nearest centimeter without shoes was recorded for each subject. Bronchodilators were withheld 12 hours before basal testing in experimental group. The tests were carried out in sitting posture with nose-clip applied. All tests were carried out between 0830 and 1400 hours. The procedure of each maneuver was explained to the subject in detail.

The baseline tests i.e. Forced Vital Capacity (FVC), FEV<sub>1</sub>, FEV<sub>1</sub>/FVC%, Forced Expiratory Flow (FEF) 25-75%, Peak Expiratory Flow Rate (PEFR), Thoracic Gas Volume (TGV) and Total Lung Capacity (TLC) were performed prior to drug administration. The tests were repeated 30 min after administration of 2 tablets of Adhatoda Vasica (Hamdard Waqf, Pakistan). At-least three FVC maneuvers according to standard method

recommended by American Thoracic Society were obtained for each subject. The largest of the three FEV<sub>1</sub> was accepted. TGV and TLC were measured while subjects were seated in the Body Plethysmograph. Doors of body box were sealed while subjects performed the maneuver.

Data is reported as mean  $\pm$  standard deviation (SD). Groups were compared by student's "t" test. A p-value less than 0.05 was considered statistically significant.

## RESULTS

A comparison of baseline PFTs in control and mild asthmatic groups is given in Table-I. It shows statistically significant difference in values of FEV<sub>1</sub>, FEV<sub>1</sub>/FVC%, FEF 25-75%, PEFR, TGV and TLC.

PFTs	Control n = 20 Mean $\pm$ SD	Mild n = 20 Mean $\pm$ SD	Mild vs Control P- value
FVC, (Litres)	3.94 $\pm$ 0.52	3.68 $\pm$ 0.74	NS
FEV <sub>1</sub> (Litres)	3.39 $\pm$ 0.49	2.87 $\pm$ 0.36	<0.05*
FEV <sub>1</sub> /FVC (%)	85.98 $\pm$ 6.00	79.58 $\pm$ 9.65	<0.05*
FEF 25-75(%)	3.88 $\pm$ 0.67	2.86 $\pm$ 0.65	<0.05*
PEFR (Lit/Sec)	7.13 $\pm$ 1.06	5.68 $\pm$ 1.07	<0.05*
TGV, Liters	3.33 $\pm$ 0.33	3.76 $\pm$ 0.24	<0.05*
TLC, Liters	6.32 $\pm$ 0.44	6.83 $\pm$ 0.63	<0.05*

n = Number of subjects, VS = Versus,  
\* = Significant, NS = Non-Significant

Effect of administration of Adhatoda Vesica in control and mild asthmatic group is given in Table-II. It shows significant difference in the value of FEV<sub>1</sub>/FVC% while all other PFTs show a non-significant difference.

Percentage of subjects having more than 15% change above baseline FEV<sub>1</sub>. It projects that 65% of mild asthmatics showed an increase of more than 15% after administration of Adhatoda Vesica. A comparison of age,

weight and height of subjects in both the groups is given in Table-III.

PFTs	Control n = 20 Mean $\pm$ SD	Mild n = 20 Mean $\pm$ SD	Mild vs Control P-value
FVC( Liters)	4.03 $\pm$ 0.54	4.15 $\pm$ 0.81	NS
FEV <sub>1</sub> (Liters)	3.44 $\pm$ 0.45	3.40 $\pm$ 0.59	NS
FEV <sub>1</sub> /FVC (%)	85.50 $\pm$ 4.09	81.99 $\pm$ 7.14	<0.05*
FEF 25-75(%)	4.01 $\pm$ 0.64	3.72 $\pm$ 0.41	NS
PEFR (Lit/Sec)	7.19 $\pm$ 1.00	6.90 $\pm$ 0.88	NS
TGV,(Liters)	3.39 $\pm$ 0.37	3.32 $\pm$ 0.27	NS
TLC, (Liters)	6.31 $\pm$ 0.54	6.18 $\pm$ 0.51	NS

n = Number of subjects, VS = Versus,  
\* = Significant, NS = Non-Significant

Parameters	Control n = 20 Mean $\pm$ SD	Mild n = 20 Mean $\pm$ SD
Age (yrs)	39.95 $\pm$ 7.93	41.85 $\pm$ 8.11
Weight (Kg)	69.95 $\pm$ 13.70	66.50 $\pm$ 12.41
Height (m)	1.68 $\pm$ 0.08	1.72 $\pm$ 0.07

## DISCUSSION

The degree of airflow limitation rather than the symptoms of disease has been recognized as the important factor in determining outcome in patients with obstructive illness so more attention is paid to the detection and improvement of airflow limitation<sup>5</sup>. This study reveals that spirometric data of subjects having mild bronchial asthma present basal values of expiratory flow-rates significantly lower (p<0.05) than healthy subjects. They also showed significantly higher (p<0.05) values of static lung volumes, reflecting the over inflation of lungs<sup>11</sup>.

The percentage of post bronchodilator change from

baseline in various parameters is used to interpret the response in patients with asthma<sup>12</sup>. In our study the data indicate that patients with reversible obstructive airway disease can be identified in pulmonary function laboratory by improvement in post bronchodilator dynamic lung function parameters as FVC, FEV<sub>1</sub>, FEF<sub>25-75%</sub> and PEFR.

This study illustrates that broncho dilatation was effectively induced after administration of Adhatoda Vesica in 65% of mild asthmatics. Changes in FEV<sub>1</sub> identify the overwhelming majority of patients with significant acute response to bronchodilators. The FEV<sub>1</sub> is considered as the gold standard for lung function evaluation as it relates well with the development and presence of disease and is the single most reproducible lung function test<sup>4</sup>.

## CONCLUSION

The post bronchodilator change of 15% or more above baseline is a useful valid measure of bronchodilator response.

Assessment of FVC, FEV<sub>1</sub>, FEF<sub>25-75%</sub>, PEFR and static lung volumes yield meaningful additional information regarding reversibility of airway obstruction. We suggest that further detail analysis of herbal remedies by multiple scientific analytic procedures is needed to evaluate their efficacy, as by PFTs.

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