

## Research Article

# Study effect of two breathing techniques on pulmonary function in asthma

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### Abstract

Aim of our study is effect of breathing techniques on pulmonary functions in bronchial asthma before and after yogic pranayama intervention of 2 months. Eighty stable asthmatic-patients were randomized into two groups i.e. group 1 (Pranayama training group) and group 2 (control group). Each group included forty patients. Lung functions were recorded on all patients at baseline, and then after two months. Both the groups were allowed to continue with their usual physical activity and medications. Group 1 subjects showed a statistically significant improvement ( $P < 0.001$ ) in Forced vital capacity (FVC), Forced expiratory volume in 1st sec (FEV1), Peak expiratory flow rate (PEFR). Quality of life also increased significantly. Training-induced changes were greater in group 1 than 2 for following variables: increase of FVC (% predicted) ( $p = 0.11$ ), FEV1 (% predicted) ( $p = 0.15$ ), PEF (% predicted) from ( $p < 0.05$ ). It was concluded that pranayama & yoga breathing techniques are useful to increasing the strength of chest muscles, expand the lung capacity, raise energy levels, and calm the mind and body.

**Keywords:** pulmonary function; asthma; pranayama

## 1. Introduction

Bronchial asthma is a common disease and an important cause of morbidity among both children and adults. The signs and symptoms of Asthma depend on bronchospasm, inflammation & narrowing of airway, hyper sensitivity of bronchioli and disturbances in bronchodilators and corticosteroids<sup>1</sup>. In India, the prevalence of asthma is found to be about 2.4% in adults over 15 years of age using the International Union against Tuberculosis and Lung Disease (IUATLD) questionnaire<sup>2</sup>. Pranayama is one of the main tools in yogic practices. It brings back our consciousness and tune with cosmic energy. In pranayama left side nostril is activate the pingala and it stimulates the sympathetic arousal, same like left nostril activate the ida and it is responsible for parasympathetic arousal<sup>3</sup>. Continues and prolong breath holding time decreases the respiratory centers responses on CO<sub>2</sub>.<sup>4</sup> It can give different physiological and psychological changes in healthy individuals. Regular practices of pranayama improve the parasympathetic tone, reduce the stress and strain of the mind & body by decreases the sympathetic activity<sup>5</sup>. Pranayamas like bhastrika and anulom-vilom pranayamas are the core structuration of pranayama. Pranayama practice improves the ventilatory function of the lung and breath holding time. Studies have shown that regular practice of pranayama leads to improvement in respiratory sensation and physiological function of lung<sup>6</sup>. Rapid succession of forcible expulsion is a characteristic feature of bhastrika pranayama, where as anulom-vilom pranayama is also called "nadi shuddhi" pranayama, in this breathing technique you inhale from one nostril at one time and release the breath through another nostril. Pranayama breathing exercise appears to alter automatic response to breathe holding probably by increasing vagal tone and decreasing sympathetic discharges<sup>7</sup>. Breathing through selected nostril has a marked activating effect or a relaxing effect of the sympathetic nervous system.

## 2. Material and Methods

The study was conducted on 80 diagnosed stable patients of bronchial asthma of either sex having disease duration of more than one year. The patients were recruited from department of pulmonology, Narayana medical college and hospital, Nellore. Non smokers, in the age group of 20-60 years with mild to moderate grades of bronchial asthma were included. Subjects with a history of an exacerbation or respiratory tract infections, current smokers, Cardio vascular diseases, musculoskeletal chest deformities, history of tobacco chewing, pregnant or lactating women and alcoholism were excluded. The medication for asthma was kept same throughout the study period. The study was explained to the patients and their signed informed consent was taken. Ethical clearance was obtained from Institutional ethical committee of Narayana Medical College, Nellore. Patients were randomized into the following two groups: Group 1 (Pranayama training group) and Group 2 (control group).

### 2.1 Study Design

Each subject was first explained the complete pranayamas procedure which is explained in text "hathayogapradipika" and was demonstrated the same. Yogic exercises used by the included pranayamas (anulom-vilom & bhastrika). Each yoga timing session was 30 minutes duration per day with a trained instructor for a period of 12 weeks. Subjects were instructed to practice at home, 30 minutes daily on all days of the week. The subjects also maintained a diary record of each day of the yoga practice.

### 2.2 Method of Pranayama

#### 2.2.1 Bhastrika Pranayama

Subject was requested to sit in padmasana or sukhasana, in such a way that head, neck and vertebral column would be in straight line. Then ask them to inhale and exhale through both nostrils as fast as they can, just as a pair of bellows of the blacksmith was works. This procedure would be performed

for 10 to 20 times, then ask them to take long inhalation and long exhalation thus the first chakra would be completed. Ask them to complete such three chakras. This procedure was performed for 5 minutes. (5 mints relaxation)

**2.2.2 Anulom-Vilom Pranayama**

Subject was requested to sit in padmasana or sukhasana, in such a way that head, neck and vertebral column would be in straight line. Then ask them to keep their right hand in pranava mudra (Bend at your index and middle finger).Close the right nostril with the thumb and breathe in through the left nostril and close the left nostril with the ring finger, release the pressure of the thumb on the right nostril and while breathing out through the right nostril. Next inhale through the right nostril, practice same manner. At the end of inhalation close the right nostril, open the left nostril and exhale through the left nostril. This is one round; ask to practice this performance for 15 minutes. (5 mints relaxation)

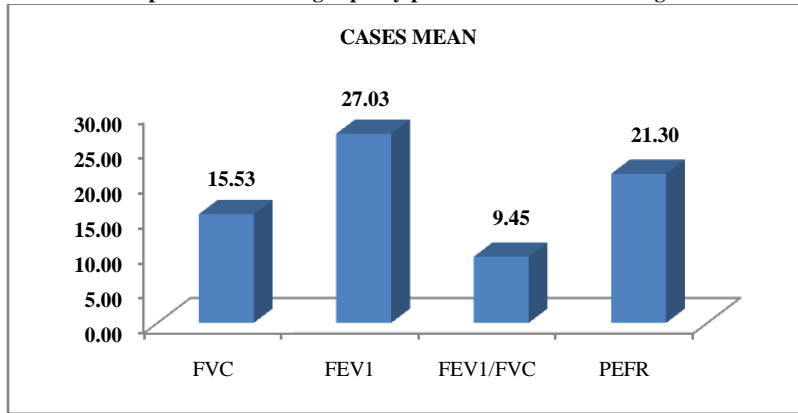
**2.3 Parameters**

The pulmonary function tests were assessed prior to yoga training and at the end of 3 months of yoga. The pulmonary function tests were carried out on each stable subject using computerized instrument. Adequate demonstration was given till subject has comprehended the instructions. Patient s were than subjected to pulmonary function tests including Forced Vital Capacity – FVC (l), Forced Expiratory Volume in first second – FEV1 (l), Ratio of FEV1/FVC (%) expressed in percentage, Peak Expiratory Flow Rate – PEFR ( l / se c ). A total of 4 tests were carried out and vitality was considered for analysis.

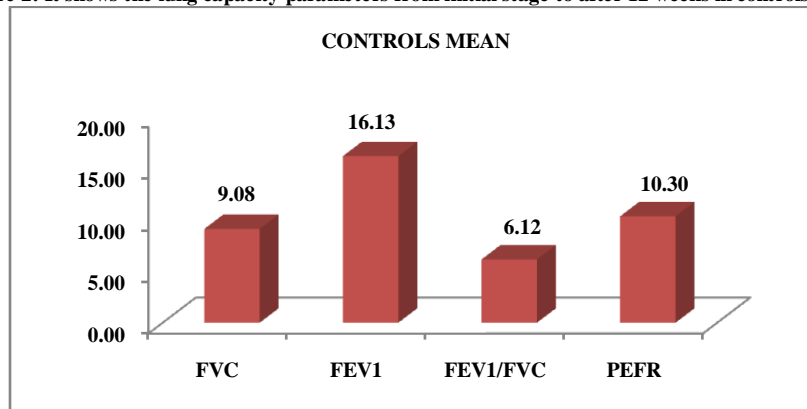
**3. Results**

After 12 weeks, there were significant improvements in FVC, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC, PEFR in case group than control group.

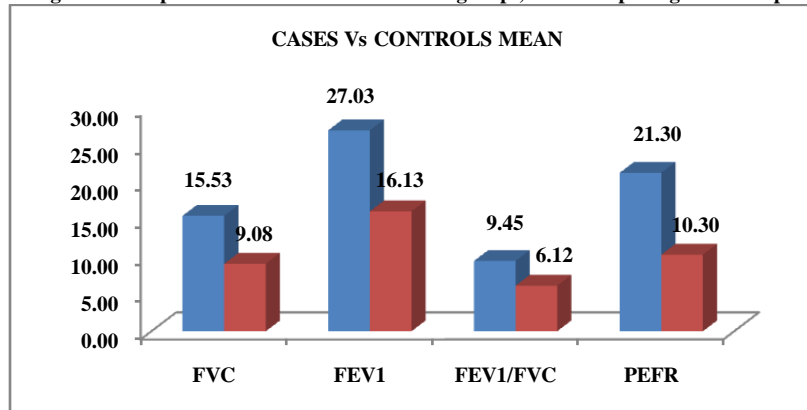
**Figure 1: It shows the marked improvements of lung capacity parameters from initial stage to after 12 weeks in cases group.**



**Figure 2: It shows the lung capacity parameters from initial stage to after 12 weeks in controls group.**



**Figure 3: Shows the differential significant improvements in cases and control groups, after completing 12 weeks pranayama training programmed.**



Significance of FVC, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC, and PEFr was analyzed by using SPSS V.16.0. To test the difference between the cases and controls paired sample t-test was used and to test the relationship between cases and controls, Pearson correlation was calculated. All the *p*-values <0.05 were considered as significant.

We selected the patients having the age group of 20- 60 years of both sexes, and they were able to do pranayama daily. They were having a history of asthma since 5 -6 years. Before the treatment of pranayama the signs and symptoms (cough, dyspnoea) of patient was very high and finally after the end of second month the rate of symptoms was reduced significantly.

#### 4. Discussion

Asthma is a morbid and multifactor disease and it can be fatal. Some factors induce asthma like family & occupational history, stress, cold climate, bacterial and viral infections, tobacco smoking<sup>8</sup> etc. It produces some signs and symptoms like cough, dyspnoea, wheezing etc. So many proved data's indicating some psychological factors can interact the asthmatic diseases to improve and worsens the condition of the disease<sup>9</sup>. The mechanism of these psychological factors is complex still now not understood.

Pranayama has been used to treat respiratory diseases in olden days. Actual pranayama means the process of deep inhalation and deep exhalation. These two activities starts continues and nonstop from birth. Several studies have proved Pranayama to be helpful in treat the asthma<sup>10</sup>. The mechanism by which pranayama is increasing the depth of breathing than normal depth of breathing. Lungs expand considerably and walls of the alveoli are stretched to maximum. Then it stimulates the stretch receptors situated in the alveolar walls. Chest continues to expand under cortisol control<sup>11</sup>. By doing so, it increase the surface area and air diffusion across the alveoli membrane. Exchange of O<sub>2</sub> and CO<sub>2</sub> across the thin wall of the alveoli and blood capillaries takes place more as they practice more time. As the expiratory reserve volume of the air is used the air containing CO<sub>2</sub> is squeezed out from the lungs<sup>12</sup>. Slow breathing like pranayama reduces the response of chemoreflex to hypercapnia and hypoxia. During slow breathing baroreflex sensitivity also high compared to the normal breathing<sup>13</sup>. It stimulates the theta amplitude and delta waves, which is indicate the parasympathetic state arousal<sup>14</sup>. Pranayama activates the pulmonary stretch receptors and which induce the duration & frequency of inhibitory neural impulses<sup>15</sup>. Lung inflation is a main physiological stimulus to release lung surfactant and prostaglandins into alveolar space and it reduces the tone of bronchial smooth muscle<sup>16</sup>. Some studies proved that after completing pranayama the percentage of total lung capacity, Inspiratory reserve volume, expiratory reserve volume, residual volume was increased<sup>17</sup>. Our results have showed that some significant increase in FVC, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC, PEFr with 3 months of training.

Our conclusion is to pranayama gives the good positive effects on asthmatic patients. There were some significant improvements in lung function parameters. Patients has reduced symptoms and able to reduce the medications.

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