

*Original Research Article*

# Effect of Pranayama in Controlling Symptoms and Improvement in Pulmonary Function in Mild to Moderate Asthmatics in Adolescent Age Group (Not on ICS)

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**Abstract**

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The aim of this study is to determine the effect of Pranayama in controlling symptoms and improvement in pulmonary function in adolescent asthmatic children who were not on long-term inhalational anti-asthmatics. Sixty children in the age group of 10-15 years who were mild to moderate asthmatics according to GINA (Global Initiative for Asthma 2018) guidelines, and not on any long term medications. Thirty were assigned randomly to the study group and was advised to do pranayama routinely for 30 minutes daily. Out of the 30 children in study group 24 children showed significant improvement compared to 2 in the control group during nine month follow-up period. Out of 30 patients in the study group on follow up 24 children significantly improved on Pulmonary Function Tests. 5 had poor pulmonary function test with episodic respiratory symptoms and 1 had severe attack. Out of 30 patients in the control group on follow up 28 had poor pulmonary function test and only 2 significantly improved. A statistically significant higher FEV1 values were observed in the study group compared to the control group in the end of the study period with  $p < 0.001$ . Breathing exercise which is a cost effective method can improve the quality of life. As a complementary therapy Pranayama can be advised in mild to moderate asthmatic.

**Keywords:** Asthma, Adolescent age group, Breathing exercises, Pranayama, Yoga

## INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways characterized by an obstruction of airflow, which may be completely or partially reversed with or without specific therapy. Asthma in pediatric population is the most prevalent chronic disorder. According to WHO around

235 million people presently live with asthma (<https://www.who.int/news-room/factsheets/detail/asthma>).

According to GINA guidelines 2109, "Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respi-

ratory symptoms such as wheezing, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.” (GINA Report, 2019).

Of the total global DALY's (Disease Adjusted Life Years), due to chronic respiratory diseases in 2016, 32.0% occurred in India. COPD and asthma were responsible for 75.6% and 20.0% of the chronic respiratory disease DALYs, respectively, in India in 2016 (Disease Study, 2016).

Number of deaths due to asthma in India is 0.51% of all deaths in age of 5-14 years and in Karnataka it is 0.39/100000 in the year 2017 (GBD, 2019).

Direct and indirect costs related to disease constitute a significant burden on asthmatics. There has been a 43% increase in the prices over a 4-year period (2012–2016) (Sharma, 2017). A study on cost of asthma treatment in a private healthcare facility in South India, where the annual cost of asthma treatment has been calculated to be 18,737 INR (Aneeshkumar and Singh, 2019).

Breathing is an autonomous function of the body that we perform even without concentrating on it. Pranayama teaches us the proper way to breathe. With yoga breathing, we increase the capacity of our lungs, increasing oxygen supply to the body to function well. Yoga breathing, or Pranayama, is the science of breath control. It consists of a series of exercises especially intended to meet the body's needs and keep it in vibrant health. Pranayama comes from the following words (Sanskrit-English Dictionary, Koeln University, Germany):  
Prana - life force or life energy  
Yama - discipline or control  
Ayama - expansion, non-restraint, or extension

There are four stages of Pranayama - Arambha, Ghata, Parichay and Nispatti

An asana is a body posture, originally a sitting pose for meditation and later in hatha yoga and modern yoga as exercise, reclining, standing, inverted, twisting, and balancing poses to the meditation seats (Patanjali Yoga sutras by Swami Prabhavananda). The effective breathing exercises can help in the lung clearance and reducing residual carbon dioxide (Saxena and Saxena, 2009).

### Need for the study

Asthma is stimulated by a multitude of factors including inhalation of allergens, food, exercise, respiratory infections, environmental irritants, dry or cold air and intense emotions. More than one in four children had wheezing that persisted from childhood to adulthood or that had relapsed after remission and outcomes in adult asthma may predetermine in early childhood (Malcolm et al., 2003).

Apart from pharmacological management, the psychological component of asthma is dealt with general measures like relaxation techniques, behavioural treatment and making sure the patient is provided with a conducive environment.

Pranayama has no side effects, is a non invasive technique, can implement easily, is a cost effective adjuvant and a relaxation technique

Asana (passive stretching of muscles) and pranayama (voluntary regulation of breathing) affects the body in several ways. Asana enhances the muscles fitness (Moses, 1972; Karambelkar et al., 1982; Morley, 1993; Jain et al., 1991) and decreases the muscle tension. Decrease in muscle tension reduces the level of arousal and physiological reactivity to stress (Vedanthan et al., 1998; Singh et al., 1990).

### Breathing exercises/ Pranayama performed by group

Breathing exercises/pranayama performed by group  
Deep breathing (deep inspiration and deep expiration): subjects sit in sukhasana and perform deep inspiration and expiration through both nostrils

1. Sasankasana breathing: (5 min) subjects sit in Vajrasana with their hands back, Step:-

- Place the hands behind the back, make a fist using your right hand and hold right wrist in left hand
- Relax the shoulders and inhale while bending backwards and opening up the chest
- While exhaling slowly bend forward from the waist bringing forehead on to the ground in front of the knees.
- While inhaling slowly come up to vertical position and slightly lean back, repeat cycle for 10 times

2. Anulomavilomapranaayama: common breathing practice, in which subjects breathe through alternate nostrils while sitting in Vajrasana.

A. Surya AnulomaViloma Pranayama (5 min)

- Adopt Nasika Mudra with right hand
- Close left nostril with ring finger and little finger
- Inhale and Exhale through right nostril (Exhalation time > Inhalation time)
- Repeat this for a total of 10 cycles. One cycle contains inhalation and exhalation

B. Chandra AnulomaViloma Pranayama (5 min)

- Adopt Nasika Mudra with right hand
- Close right nostril with thumb
- Inhale and Exhale through the left nostril (Exhalation time > Inhalation time)
- Repeat this for a total of 10 cycles. One cycle contains inhalation and exhalation

C. Nadisuddhi Pranayama (5 min)

- Adopt Nasika Mudra with right hand
- Close right nostril with thumb, exhale through left nostril completely and inhale through the same.
- Close the left nostril with ring finger and little finger and exhale and inhale through the same.
- Now close the right nostril with thumb and continue with the process for 10 cycles

3. Bhramari chanting (5 min): Sitting in sukhasana subjects inhale through both nostrils and while exhaling produce sound of a female humming bee. Chanting of 'N-kara'. In Order to chant 'N-kara' chant any word end with 'N' such as 'king', 'sing', 'ring' etc and stretch the 'N' part only. Make sure lips are separated during this chanting

4. Omkara (modified) (5 min): Commonly used for meditation, but not included in regular breathing exercises, is an important exhalation exercise. Chant Om with 'M-kara' stretches and make sure lips are closed, rows of teeth are separated and tongue lie behind lower set of teeth. Changes to this exercise, keeping in mind the asthmatic expiratory difficulty with air trapping, were made so as to strengthen expiration. Patients were advised to sit in sukhasana and to inhale until further inhalation is not possible deeply and then while exhaling produce Omkara with maximum force and to continue until further exhalation is not possible (Nagarathna and Nagendra, 1998).

## Objectives of the study

The objective of our study is to determine the effect pranayama has in controlling the symptoms in mild to moderate asthmatics and also the improvement in their pulmonary function, after having practiced pranayama.

## MATERIALS AND METHODS

The study was aimed at finding the effect of Pranayama in Pediatric Asthma.

### Method

Sixty mild to moderate asthmatics were selected. They were selected based on the questionnaire answered by them and their pulmonary function tests. Asthma in these children was well controlled and they were not on any long term medication. If any of them were on long term medication, it was stopped. The guidelines followed for this recruitment are C-ACT and GINA guidelines.<sup>(24)</sup>

Recruitment of the participants were done prospectively in the first 3 months during August 2016 - July 2017, 60 children in the age group of 10 to 15 who

were detected to be asthmatic by history, examination and pulmonary function tests. Even numbered patients were allocated to group A (study group) and odd numbered patients to group B (control group). Both groups were comparable in all aspects including age, sex, symptoms and lung functions.

Group A (n=30) practiced pranayama for 30 min daily Group B (n=30) not advised pranayama and managed as per GINA guidelines.

FEV1 values were assessed during 3 monthly intervals. Pulmonary function tests were done using both peak flow meter and spirometry. None of the children were on any long term medications. FEV1 <80% with post bronchodilator reversibility of more than 12% were taken as obstructive pulmonary disease. Best of 3 results were taken. Reversibility was demonstrated by post bronchodilator response by short acting beta agonist.

A written informed consent was taken from the school teacher in-charge and the parents of those children. Awareness regarding risk factors, triggering factors associated with the condition was given to them. Children were educated as to what asthma is, its risk factor,

Asana and Pranayama were taught to the children under the supervision of a yoga expert. Pranayama was continued for 9 months and pulmonary function tests were done once in 3 months and the values documented including the values at the first visit. The subsequent results were computed.

## Inclusion Criteria

- Asthmatic Children in 10 - 15 yrs age group
- Children with mild to moderate asthma

## Exclusion Criteria

- Asthmatic Children on inhalers and steroids
- Children with severe asthma (PEFR < 50% & FEV1 < 40% of the predicted value)
- Children with other acute or chronic respiratory or associated systemic illnesses.

## RESULTS AND DISCUSSION

The mean of Age and FEV1 values measured at each examination are given in Table 1. Symptoms scoring and the predicted PEFR and FEV1 is expressed as a percentage of expected value.

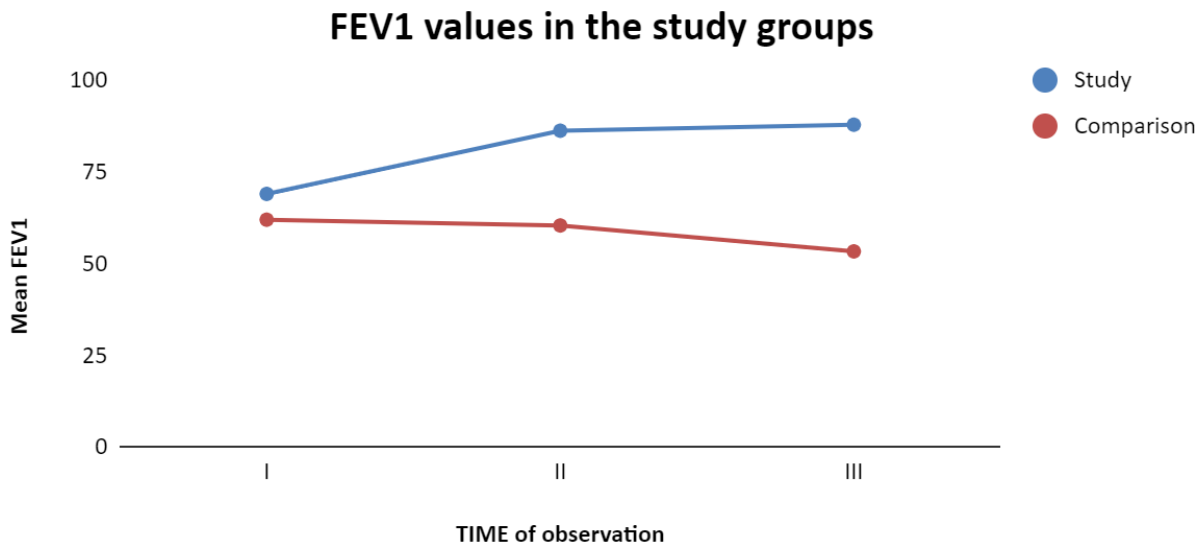
Out of 30 patients in the study group on follow up 24 children significantly improved on Pulmonary Function Tests.

5 had poor pulmonary function test with episodic respiratory symptoms and 1 had severe attack

**Table 1.** Mean±SD of Age and FEV1 Values at 3<sup>rd</sup>, 6<sup>th</sup> and 9<sup>th</sup> month after recruitment.

	AGE	FEV1 (1)	FEV1 (2)	FEV1(3)
STUDY GROUP				
Mean ± SD	12.03 1.69	68.97± 12.14	86.20 ± 22.08	87.83 ± 22.32
CONTROL GROUP				
Mean ± SD	11.63 ± 1.67	61.94 ± 14.33	60.37 ± 15.74	53.30 ± 16.60
P Value	0.2831	0.0449	<0.0001	<0.0001

P value by Student’s t-test; SD – Standard deviation



**Figure 1.**

Out of 30 patients in the control group on follow up 28 had poor pulmonary function test and only 2 significantly improved.

A statistically significant higher FEV1 values were observed in the study group compared to the control group in the end of the study period with  $p < 0.001$

Bronchial asthma, which has been increasing in incidence worldwide, is a morbid disease that can also be fatal. The important precipitating factors of asthma include occupational factors, viral infections, drugs, cold air, family history, stress, etc. It is a multifactorial disease; clinically it produces symptoms and signs like dyspnea (expiratory difficulty), cough, and wheezing. Pathologically, there is mucosal inflammation, collection of inflammatory mediators, bronchial constriction, air trapping, later on remodeling of airways. It is difficult to identify and control all the triggers in a single patient. It is better to try to improve lung functions by exercises and to correct the pathology (common result to all the triggers); so stress was given to expiratory exercises and some modification was done.

60 mild to moderate cases of bronchial asthma diag-

nosed by symptoms, questionnaires and pulmonary function tests, who were well controlled and on whom long term medications were stopped according to GINA guidelines were studied. Study reveals that introduction and practice of Pranayama (effective breathing) in mild to moderate asthmatics improves the symptoms score.

This result is similar to other studies of Nagarathna et al., Goyeche et al., and McFadden where improvement was found after yogic techniques (Goyeche et al., 1982; Nagarathna and Nagendra, 2004; Somashekar et al. The results are also different from a few studies where some other techniques were used. In the study of Cooper et al. Butekyo breathing technique (a device which mimics pranayama) was used. There was minimal improvement in lung functions (Cooper et al., 2003). Study of Slader included shallow nasal breathing with little improvement in lung functions (Slader et al., 2006). Similarly, study of Singh used pink city lung exerciser with mild effectiveness (Singh, 1987). Abundant objective data indicating that psychological factors worsen or improve the course of the disease are available. The mechanisms of these interactions are complex and not well under-

stood, but psychological factors may affect about half of all patients. Modification of vagal efferent activity seems to affect the calibre of airways.

## CONCLUSION

Asthma is a chronic illness which requires immediate attention. The physiological effect of Yoga in reducing symptoms is unknown. There is significant effect of Pranayama in children who were not on medication in improving symptoms and Pulmonary Function Tests. Prospective study confirms that Pranayama could be a complementary therapy that should be considered in mild to moderate asthmatics. Breathing exercises can reduce expenditure on relapses in the adult and improve quality of life. Further larger studies are required to recommend pranayama as one of the treatment modalities in the management of asthma.

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