



## PRANAYAMA AND MEDITATION IMPACT ON SPIROMETRIC INDICES IN ASTHMA PATIENTS

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### ABSTRACT

**Background and Objective-** Asthma is a serious health problem throughout the world, affecting people of all ages. It is a chronic inflammatory disorder of the airways. A lot of studies have been done in this field and the results were found positive. This study was, therefore, undertaken to know the efficacy of pranayama and meditation on pulmonary functions in asthma patients who were also the cases of major depressive disorder. **Methods-** It was a randomized controlled study carried out from April 2018- September 2019. Asthma patients aged between 18 to 70 years were recruited from the Department of Respiratory Medicine, King George's Medical University, U.P., Lucknow, India. They were randomly divided into two groups: 'the case group and 'the control group'. Their spirometrical assessment was done at baseline, at 4<sup>th</sup> month and 8<sup>th</sup> month. **Results-** No significant changes in spirometrical variables were found in 'the control group' during the course of the study. A steady and progressive improvement was found in the subjects of 'the yoga group' during the same period. **Interpretation and Conclusion-** 'The yoga group' got significantly better improvement in spirometrical variables than 'the control group'. The improvement was achieved relatively earlier by 'the yoga group' in comparison to 'the control group'. Result shows that yoga can be used as an adjuvant therapy with standard medical treatment for the better management of asthma.

**KEYWORDS:** Adjuvant; asthma; spirometrical variables; wheezing.

### INTRODUCTION

Asthma attacks occur when the lungs are not getting enough air to breathe with the results of coughing, wheezing, shortness of breath and a tight feeling in the chest. Asthmatic attacks can be triggered by allergies, exercise, cold, air pollution and stress related disorders. In addition to physiologic dysfunction, many people with asthma also suffer from psychological distress in the form of depression, anxiety, and emotional disorders.<sup>[1-2]</sup> Yoga has been considered as a form of Complementary and Alternative Medicines.<sup>[3]</sup> The word "yoga" comes from a Sanskrit root "yuj" which means union, or yoke, to join, and to direct and concentrate one's attention.<sup>[4-5]</sup> Regular practice of yoga provides strength, endurance, flexibility and facilitates characteristics of friendliness, compassion, and greater self-control, while cultivating a sense of calmness and well-being.<sup>[6-7]</sup> The practice of yoga produces a physiological state opposite to that of the flight-or-fight stress response and with that interruption in the stress response. It provides a sense of balance and union between the mind and body.<sup>[8]</sup> Yoga is known for its beneficial effects on physiologic and psychologic functions and improves the quality of life of the patients.<sup>[9-16]</sup> Attack of asthma involves both physical

and psychological factors. The exhalation is an important technique in managing asthma and reducing frequency and intensity of asthma attacks.<sup>[17]</sup> By regular practice of yogasanas and pranayama the constriction of bronchial tubes get very much reduced. Slowly the capacity of bronchial tubes increases to a great extent and subsequently gradually asthma can be cured from roots. The present study is a split form of study based on the findings of one of the aims of the larger study on bronchial asthma.

### OBJECTIVE

To evaluate the role of pranayama and meditation on spirometric indices in asthma patients with depressive disorders.

**HYPOTHESIS-** Yoga is a multidimensional treatment that improves the pulmonary functions in asthmatic patients along with medical treatment.

### MATERIALS AND METHODS STUDY DESIGN AND SETTING

This study was a randomized controlled trial, conducted from April 2018- September 2019 in the Department of

Respiratory Medicine, King George's Medical University, U.P., Lucknow, India. Diagnosed cases of asthma were recruited from the Out Patient Department (OPD) of the department and screened by a consultant for the participation in the study on the basis of inclusion & exclusion criteria.

The Patients were included in the study having mild to moderate persistent bronchial asthma severity according to GINA- 2018, age of the patients ranging between 18-70 years. They were non-smokers or ex-smokers who have not smoked for at least 6 months and reversible airflow limitation  $>12\%$  &  $\geq 200$  mL (Post Bronchodilator FEV<sub>1</sub>  $>12\%$  &  $\geq 200$  mL) and having depressive disorders due to asthma. Patients were excluded with severe airflow limitation or more (FEV<sub>1</sub>  $< 60\%$ ), Pregnant or lactating women, any associated chronic respiratory diseases.

### STUDY PARTICIPANTS

In this randomized controlled trial, 276 subjects who satisfied the inclusion criteria were allocated into two groups on the basis of computer generated random number table. They were divided into two groups, yoga group who received yogic intervention for 6 months along with standard medical treatment and control group who received only standard medical treatment. Out of 325 subjects (165 cases and 160 controls), 15 subjects from the yoga group and 10 subjects from the control group dropped out during the study period. 150 subjects from the yoga group and 150 subjects from the control group completed the study.

### DATA COLLECTION

Pulmonary function test was performed with a spirometer (P.K. Morgan's Spiro 232 Pulmonary System) after adjusting for age and sex according to the requirements of the GINA guidelines.

### Yogic Intervention

Subjects in the yoga group received yogic intervention (pranayama & meditation) for 35 min per day, five days in a week for a period of 8 months.

### Analysis of Data

Paired *t*-test was used to test the mean difference score of the subjects at baseline, after four months and eight

months in both groups i.e., yoga and control groups. Student's independent sample *t*-test was used to compare the differences in scores between yoga and non- yoga group. Differences were considered significant if  $p < 0.05$ . The Statistical analysis was done by using GraphPadInStat version 3.1 software Inc, year 2016 (Version. 3.05 GraphPad software, Inc., California).

### RESULTS

Spirometrical variables at baseline in between group comparison are given in Table 2. Both groups are comparable in every respect and there was no significant difference found in any variable. The values of outcome measures are given in Table 3, 4, 5 and 6.

Between groups comparisons are given in Table 3 and 4 after 3rd month and 6<sup>th</sup> month respectively the intervention of yoga to the yoga group. There was significant difference found in all the spirometrical variables (FVC, FEV<sub>1</sub>, and FEV<sub>1</sub>/FVC and PEFR) at 4<sup>th</sup> month and 8<sup>th</sup> month in between group comparison [Table 3 and 4]. At post- intervention, between group differences were found highly significant with better improvement in FVC, FEV<sub>1</sub>, and FEV<sub>1</sub>/FVC and PEFR [Table 4].

Comparison of pre and post spirometrical changes occurred in yoga group and control group at 4<sup>th</sup> month and 8<sup>th</sup> month respectively after the intervention of yoga to the yoga group are given in Table 5 and 6. It has been observed in pre- post comparison after 4 month that FVC increased significantly by 2.83%, FEV<sub>1</sub> and FEV<sub>1</sub>/FVC also increased significantly by 5.30% and 1.63%. There was significant increase of 2.37% found in PEFR in the yoga group in comparison to control group. There was no significant difference found in control group.

As seen in Table 6, both groups have significant improvement at 8<sup>th</sup> month. In the yoga group, FVC significantly increased by 6.48%, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC and PEFR increased significantly by 11.04%, 3.5% and 8.45% respectively in the yoga group. There was a significant increase of 3.79% found in FVC, FEV<sub>1</sub> and PEFR also increased significantly by 2.50% and 3.80% respectively. FEV<sub>1</sub>/FVC slightly increased significantly by 1.91% in the control group.

<b>Table-1</b>	
<b>Duration of Yogic Techniques Practiced by Yoga Group/ Cases</b>	
<b>Yogic Techniques</b>	<b>Duration (min)</b>
<b>Pranayama</b>	15
Nadishodhana	5
Bhastrika	5
Bhramari	5
<b>Meditation</b>	20
<b>Total Duration</b>	<b>35 min</b>

**Table 2: Baseline scores of cases and controls (between group)**

	Cases	Controls			
Variables	N=150, mean± SD	N=150, mean± SD	Effect Size	P value	t- statistics
FVC	82.90 ± 6.48	81.87 ± 6.12	0.42	0.18	1.22
FEV <sub>1</sub>	67.88 ± 4.86	68.56 ± 5.92	0.32	0.25	1.12
FEV <sub>1</sub> /FVC	75.45 ± 5.29	73.28 ± 6.05	0.28	0.16	1.42
PEFR	68.65 ± 5.98	65.78 ± 5.87	0.34	0.22	1.28

FVC–Forced Vital Capacity; FEV<sub>1</sub>–Forced Expiratory Volume in 1<sup>st</sup> sec.; PEFR–Peak Expiratory Flow Rate P-value not significant (>0.05) for any of the parameter.

**Table 3: Spirometrical variables at 4<sup>th</sup> month (between group)**

	Cases	Controls			
Variables	N=150, Mean± SD	N=150, Mean± SD	Effect Size	P value	t- statistics
FVC	84.25 ± 5.34	82.66 ± 5.21	0.55	<0.0001	4.42
FEV <sub>1</sub>	71.48 ± 4.06	69.88 ± 5.38	0.26	0.08	5.61
FEV <sub>1</sub> /FVC	76.68 ± 5.42	74.25 ± 5.86	0.42	0.05*	2.65
PEFR	70.28 ± 5.37	67.22 ± 5.87	0.26	0.0003***	4.42

FVC –Forced Vital Capacity; FEV<sub>1</sub>–Forced Expiratory Volume in 1<sup>st</sup> sec.; PEFR –Peak Expiratory Flow Rate  
\*P value significant (5% level of significance)  
P value not significant (>0.05) for any of the parameter.

**Table 4: Spirometrical variables at 8<sup>th</sup> month (between group)**

	Cases	Controls			
Variables	N=121, Mean± SD	N=120, Mean± SD	Effect Size	P value	t- statistics
FVC	88.28 ± 8.21	84.98 ± 5.32	1.56	<0.0001	5.37
FEV <sub>1</sub>	75.37 ± 5.04	70.28 ± 4.24	3.21	<0.0001	14.87
FEV <sub>1</sub> /FVC	78.98 ± 5.79	74.68 ± 5.14	2.84	<0.0001	5.51
PEFR	74.62 ± 4.24	68.28 ± 5.40	2.22	<0.0001	15.04

FVC –Forced Vital Capacity; FEV<sub>1</sub>–Forced Expiratory Volume in 1<sup>st</sup> sec.; PEFR –Peak Expiratory Flow Rate  
\*P value significant (5% level of significance)  
P value not significant (>0.05) for any of the parameter.

**Table 5: Comparison of pre- post spirometrical changes occurred in cases and control group after 4 month**

Variables	CASES/ YOGA GROUP					CONTROL GROUP				
	Baseline	After 4 month	% change	t statistics	P value	Baseline	After 4 month	% change	t- statistics	P value
FVC	82.90 ± 6.48	84.25 ± 5.34	2.83	2.27	0.0007***	81.87 ± 6.12	82.66 ± 5.21	0.96	0.35	0.42
FEV <sub>1</sub>	67.88 ± 4.86	71.48 ± 4.06	5.30	12.23	<0.0001	68.56 ± 5.92	69.88 ± 5.38	1.92	1.45	0.01*
FEV <sub>1</sub> /FVC	75.45 ± 5.29	76.68 ± 5.42	1.63	1.98	0.01**	73.28 ± 6.05	74.25 ± 5.86	1.32	1.34	0.10
PEFR	68.65 ± 5.98	70.28 ± 5.37	2.37	2.82	0.0003***	65.78 ± 5.87	67.22 ± 5.87	2.19	2.08	0.01**

FVC –Forced Vital Capacity; FEV<sub>1</sub>–Forced Expiratory Volume in 1<sup>st</sup> sec.; PEFR –Peak Expiratory Flow Rate  
\*P < 0.05, \*\*P < 0.01, \*\*\*P < 0.001 based on *post hoc* pair-wise comparison with baseline values.  
P- value not significant (>0.05) for any of the parameter.

**Table 6: Comparison of pre and post spirometrical changes occurred in cases and control group after 8 month**

Variables	CASES/ YOGA GROUP					CONTROL GROUP				
	Baseline	After 8 month	% change	t statistics	P value	Baseline	After 8 month	% change	t- statistics	P value
FVC	82.90 ± 6.48	88.28 ± 8.21	6.48	4.89	<0.0001	81.87 ± 6.12	84.98 ± 5.32	3.79	3.22	0.003*
FEV <sub>1</sub>	67.88 ± 4.86	75.37 ± 5.04	11.04	25.42	<0.0001	68.56 ± 5.92	70.28 ± 4.24	2.50	2.02	<0.0001
FEV <sub>1</sub> /FVC	75.45 ± 5.29	78.98 ± 5.79	3.53	3.11	<0.0001	73.28 ± 6.05	74.68 ± 5.14	1.91	2.15	0.01*
PEFR	68.65 ± 5.98	74.62 ± 4.24	8.45	23.45	<0.0001	65.78 ± 5.87	68.28 ± 5.40	3.80	3.19	0.002*

FVC –Forced Vital Capacity; FEV<sub>1</sub>–Forced Expiratory Volume in 1<sup>st</sup> sec.; PEFR –Peak Expiratory Flow Rate  
\*P < 0.05, \*\*P < 0.01, \*\*\*P < 0.001 based on *post hoc* pair-wise comparison with baseline values.  
P- value not significant (>0.05) for any of the parameter.

## DISCUSSION

The results of this study suggests that both groups got significant improvement in 8 month study period compared to baseline scores, but the improvement was achieved relatively earlier by the yoga group in comparison to control group. Between groups differences at 8<sup>th</sup> month were found highly significant with better improvement in all the spirometrical variables.

A randomized controlled study of 60 patients has shown that lung functions improved significantly in the patients of the yoga group after two months of the yoga practice from the baseline. Pranayama & yoga breathing can used to increase respiratory stamina, relax the chest muscles, expand the lungs, raise energy levels, and calm the body.<sup>[18]</sup>

A study has shown the effect of yoga on asthmatic patients and concluded that there was significant improvement found in peak expiratory flow rate (PEFR).<sup>[19]</sup> A short term study has also concluded that the significant change was found in FEV<sub>1</sub> and PEFR in the yoga group after the regular practice of yoga for 8 week of study period from the baseline. This study supported the efficacy of yoga in the management of bronchial asthma.<sup>[20]</sup>

A study has shown the effect of yoga training on pulmonary functions and revealed that the yoga breathing exercises are beneficial in asthma patients and used adjunctively with standard pharmacological treatment significantly improves pulmonary functions in patients with bronchial asthma.<sup>[21]</sup> A study was being done on standard 8<sup>th</sup> students and reported that lung function improved statistically in the students of the yoga group. They suggested that yoga be introduced at school level in order to improve physiological functions, overall health and performance of students.<sup>[22]</sup>

In a study the effect of buteyko technique and pranayama in the bronchial asthma patients for 6- month period has been reported and concluded that there was no significant change found in lung functions of the patients.<sup>[23]</sup>

Effectiveness of relaxation therapy has been studied in a group of asthmatics; and found mental relaxation to be more effective than muscular relaxation in the improvement of pulmonary function and subjective measures.<sup>[24]</sup>

A study was being done on 17 bronchial asthma patients age ranged between 19 to 52 years. The results of this study showed that the subjects in the yoga group reported a significant degree of relaxation, positive attitude, and better yoga exercise tolerance. There was also a tendency toward lesser usage of beta adrenergic inhalers. The pulmonary functions did not vary significantly between yoga group and control group. Yoga techniques seem

beneficial as an adjunct to the medical management of asthma.<sup>[25]</sup>

A study of yoga was being done on 9 asthmatic patients for 7 days. It was being a short term study on least number of the asthma patients. The results of this study showed no significant change in FVC, FEV<sub>1</sub> and PEFR.<sup>[26]</sup>

A randomized controlled study on 241 patients of mild to moderate persistent chronic bronchial asthma concluded significantly better improvement in spirometric variables than controls.<sup>[27]</sup>

The previous studies support our findings but most of them were short-term studies and small number of patients being studied. However, probably none of the study has shown the efficacy of yoga on spirometrical variables in asthmatics in India as done in the current study.

## CONCLUSION

The current study shows that the yogic intervention significantly increased the FVC, FEV<sub>1</sub>, and PEFR in the yoga group in comparison to control group. The improvement was achieved relatively earlier by the yoga group in comparison to control group. Overall, this study shows that yoga is an effective tool to improve the pulmonary functions and it can be practiced as an adjuvant therapy with standard medical treatment.

## SUGGESTIONS FOR FUTURE WORK

Due to the small number of controlled trials and least number of the patients being studied, it is not possible to make firm judgments regarding the long-term efficacy of yoga. It is recommended that to more carefully construct randomized controlled trials.

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## Conflicts of interest

There is no conflict of interest.

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