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Exploring the impact of mudra on respiratory function among Asthma Patients

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ABSTRACT

Background: Globally, the prevalence of asthma is rising, and drug therapy alone has yet to effectively manage it. We implemented nonpharmacological interventions like yoga with promising outcomes.

This study aims to determine how mudra affects asthmatic patients' respiratory function.

Aims and Objectives: The aim of the study was to find out the exploring the efficacy of 12 weeks of mudra practice on PEFR and BHT among asthma patients of yoga intervention group compared than the control group.

Materials and Methods: 80 stable asthma patients between the ages of 30 - 45 were the subjects of this intervention. They were allocated into two groups at random, the control group (n=40) and the yoga practicing group (n=40). The yoga practicing group underwent mudra practice everyday morning and evening for 30 mins for 5 days a week for 12 weeks. Control group will not receive any yogic practices. PEFR and BHT tests were measured before and after 12 weeks using peak flow meter and stopwatch.

Results: Statistically significant improvement ($p < 0.05$) was observed for PEFR and BHT in the yoga practicing group when compared with the control group.

Conclusion: After 12 weeks of mudra practice, asthmatic patients' respiratory efficiency significantly improved.

Keywords: *Mudras, Asthma, Peak expiratory flow rate, Breath holding time.*

1. INTRODUCTION

Asthma is a chronic lung disease. It causes the lungs to swell and constrict, and the person may cough up excess mucus. (Joshi, N & Paul, B., 2023). Asthma is a heterogeneous disease that is generally marked by long-term inflammation of the airways. A history of breathing problems, including wheezing, shortness of breath, chest tightness, and coughing, which vary in frequency and intensity over time, as well as variations in the amount of air that can leave the lungs, distinguishes it. (WHO, 2024). Among adolescents, asthma is the most prevalent chronic respiratory disease. The World Health Organization (WHO) estimates that asthma affects 300 million individuals, with 250,000 deaths from the condition in 2005, despite its relatively low fatality rate compared to other chronic diseases. Developing countries account for more than 80% of asthma-related fatalities. According to the available evidence, asthma affects approximately 8% of the population in the Eastern Mediterranean Region (GINAAsthma,2024). According to the Indian Study on Epidemiology of Asthma, Respiratory Symptoms, and Chronic Bronchitis in Adults (INSEARCH), 17.23 million persons in India suffer from asthma, accounting for 2.05% of the population. (Jindal SK, 2012). Non-invasive pulmonary function tests (PFTs) are used to evaluate lung health. Lung capacity, flow rates, and oxygen exchange are also evaluated. The healthcare professional may use this data to better identify and treat lung diseases (Lung Function Tests, 2023).

The Peak Expiratory Flow rate (PEFR), which gauges the amount of air that is forcibly evacuated from the lungs during a single, rapid exhale, is one of the most common lung functions. It is an exact measure of the quality of ventilation and the obstruction of airflow. Characteristics such as height, age, and sex are associated with variability in the typical peak flow value. In the assessment and management of asthma, it is essential to obtain a patient's peak flow reading, a straightforward and rapid clinic procedure. Peak flow data can be evaluated to assess the severity of asthma and determine a prognosis (Peak expiratory flow rate, 2023). Breath-holding time (BHT) is the duration of time that an individual spends retaining their breath for as long as possible. The typical duration is approximately 45–60 seconds, and it is contingent upon both chemical and non-chemical stimuli. It is a metric used to evaluate the endurance of dyspnea and the strength of the respiratory muscles. In the assessment of obstructive diseases, it may be positively correlated with forced vital capacity and FEV1(Saravanan, P et al., 2019).

Yoga, as a traditional and complementary medicine, is gradually becoming a more important non-pharmacological therapeutic option for patients with asthma (Turan, G. B., 2020). "Yoga" comes from the Sanskrit word "yuj," which means "to connect." Yoga connects each person's consciousness to the consciousness of the universe. (Raub, J. A. 2002). Yogic practices comprise asanas, mudras, Pranayamas and meditation. The specific mudras have the potential to enhance the functioning of your respiratory system and effectively treat asthma. (Saravanan, P et al., 2019). Yogic practices improve the physiological functioning of the heart and lungs and enhance the body's flexibility, and transfer stem cells from the bone marrow to blood vessels throughout the body, facilitating tissue repair and regeneration (Shree, N., & Bhonde, R. R. 2016). Mudras were a part of yogic literature along with asanas and breathing exercises. Mudras involve body, or eyes, tongue, and hands specifically. Hasta mudras indicate delightful hand postures (Saravanan, P et al., 2019). Each fingernail has about 3,000 nerve endings just under the skin's surface. Our hand has about 100,000 nerves. The hand takes up a lot of space in the cortex of the brain, and each part of the hand is connected to a different part of the brain. Pressing on our fingers and hands triggers the parts of the brain that are connected to them. As a result, we use hasta mudras to change brain waves, talk to the body-mind energy system, and make pressure points work. The hasta mudras can be directly help us to breathe better (Singh, K et al., 2015). Literature shows that lung-specific mudras may improve breathing by expanding the airways and decreasing the amount of mucus that builds up. Many sensations in the body start in the neurological system, and other changes occur on the psychological level. So, mudras and bandhas play a very crucial role in activating the sensations of annamaya kosha, pranayama kosha, and manomaya kosha when we enter them (Saraswati, S. S. 2004).

Literature Review

Yadav et al. (2024), Conducted a study found that yogic practices significantly enhance asthma control, with a difference of more than 5 points after 13 weeks in the yoga exercise group compared to the non-yoga exercise group. Additionally, these practices resulted in a decrease in exacerbation-related expenses. The objectives of the study were to find out the effects of 13 weeks of yogic practices on asthma control in asthma patients. The ages of the subjects were between 18 - 60 years. All the patients of the experimental group practiced yogic practices for 30 minutes a day for six days per week for 13 weeks. After 13 weeks of yogic practices, the asthma control was significantly improved among the asthma patients.

Agnihotri, Kant, S., & Mishra (2016) found that yoga can serve as an adjuvant therapy alongside normal medical treatment to enhance asthma control. Patients between the ages of 12 and 60 with mild-to-moderate chronic asthma (FEV1 > 60%) were the subjects of this research. We randomly split additional patients into a control group and a yoga group. We gathered data before the training and again after the third and sixth months. The results of the statistical analysis of the data revealed a significant improvement in the variables pertaining to the yoga group.

Saravanan et al. (2019) conducted a study which revealed that mudra practices significantly improved PEFR, BHT, ST, EBT, and RET on experimental group compared than the control group. The ages of the subjects were between 20 - 50 years. For

six weeks, all patients in the experimental group practiced yoga for 30 minutes every day, six days a week. After 6 weeks of yoga practice, asthma patients' lung functioning improved significantly.

2. METHODOLOGY

Study design

The current study was done in the department of Pulmonary medicine of a SRM MCH& RC, Chengalpattu district. This study was designed to find out to explore the impact of mudra on respiratory function in patients with asthma. This study was designed as a randomized controlled trial. Participants were allocated into two groups in 1:1 ratio.

Justification of Sample size

The sample size was determined to compare the means of each group using an effect size of 0.60, an alpha error of 0.05, and a power of 0.80. G*Power version 3.1 computed a sample size of 72 participants, adjusting for 10% attrition. As a result, a final sample size of 80 was chosen for the current study.

Inclusion and exclusion criteria

We screened and included patients aged 30 to 45 years, diagnosed with mild to moderate asthma according to Global Initiative for Asthma (GINA) criteria and without exacerbations in the preceding month. Exclusion criteria for the study included severe asthma, pregnancy, musculoskeletal issues, cervical or back discomfort, a history of arthritis, hypertension, or any grave illness such as myocardial infarction, stroke, or end-stage renal disease, as well as those unable to provide written informed consent.

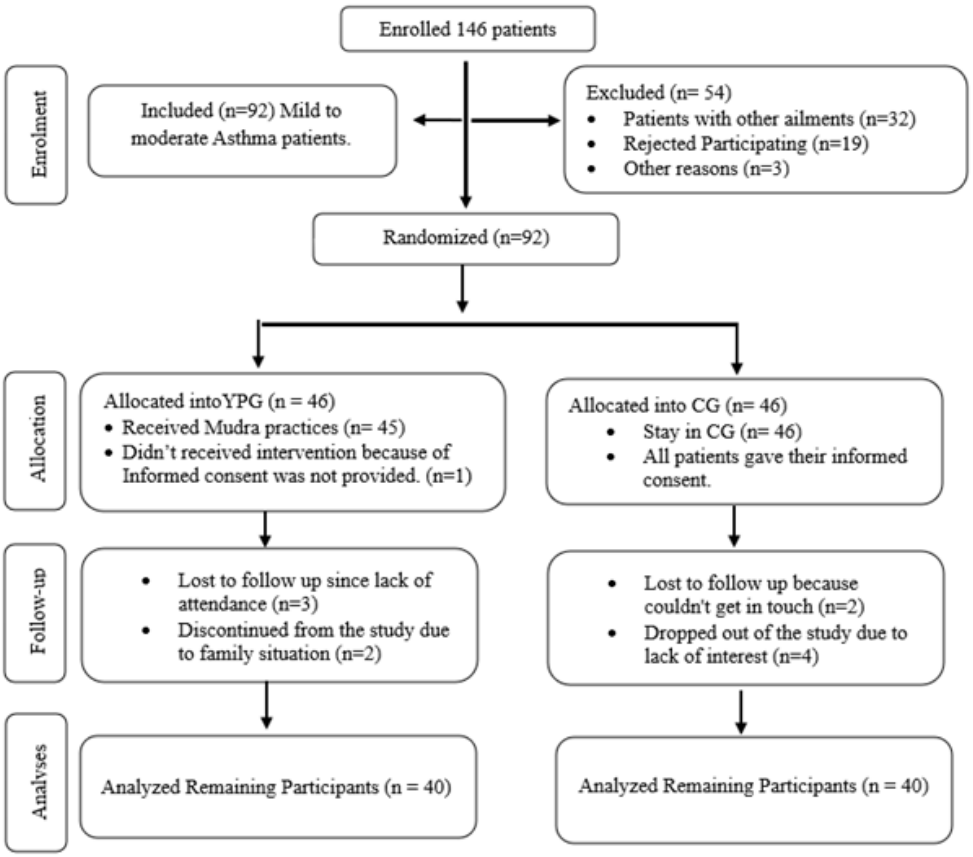

Figure 1. Participants Allocation as per Consort Guidelines

Randomization, allocation and baseline measure

After assessment, 80 participants were determined to be eligible. They were randomized (1:1) into the yoga training (n = 40) or control (n = 40) groups. Allocation concealment was achieved using sequentially numbered opaque sealed envelopes, and randomization was conducted using computer-generated random numbers. The expenditure at baseline was estimated for both categories.

Informed consent

Participants were told about the study's design, protocol, data collecting method, anticipated benefits, and other relevant details. Every participant is entitled to withdraw from the research at any time throughout the intervention period. The informed permission form told participants that the acquired data would be used solely for scientific reasons, with their identities kept anonymous.

Intervention

A 45-minute structured yoga exercise was delivered for six days every week for a total duration of 12 weeks. The control group did not receive any yogic practices. Throughout this study's time, both groups got normal medical treatment. The yoga schedules are list out in Table1.

Table 1. Yoga Schedule

S. No	Yoga techniques	Duration
1	**Loosening the joints**	10 minutes
2	**Mudra**	
	Mugula Mudra	5 Minutes
	Prana Mudra	5 Minutes
	Apana Mudra	5 Minutes
	Prithvi Mudra	5 Minutes
	Linga Mudra	5 Minutes
	Shankh Mudra	5 Minutes
3	**Relaxation**	5 Minutes
Total Duration		**45 Minutes**

Statistical analysis

A paired t-test was used for within the yoga practice group and an independent t-test between the groups. P-values < 0.05 were regarded as significant. Normal distribution, equality of variance, mean, standard deviation (SD), degree of freedom, t value, and p value were among the data represented in the tables.

3. RESULTS

Table 2: Independent t test

Parameter Names	Normality Shapiro-Wilk Test		Equality of variance -Levene test	CG-Post Mean± SD	YPG-Post Mean ± SD	t	df	p
	CG POST	YPG Post						
PEFR	0.351	0.079	0.205	364.93±1.03	420.28±23.8	12.6	78	<0.001
BHT	0.127	0.101	0.929	15.5 ± 2.33	24.18 ± 2.23	17.01	78	<0.001

Note: PEFR-Peak expiratory flow rate, BHT-Breath holding time

Table 3: Paired t test

Parameter Names	Normality Shapiro-Wilk Test	YPG- PRE Mean ± SD	YPG-Post Mean ± SD	t	df	p
PEFR	0.175	375.5 ± 39.85	420.28 23.8	6.1	39	<0.001
BHT	0.101	15.33 ± 2.6	24.18 ± 2.23	22.51	39	<0.001

Note: PEFR-Peak expiratory flow rate, BHT-Breath holding time

The Table 2 shows the results of independent - t test which was executed between post values of YPG and CG. In the Shapiro-Wilk Test, the p values for YPG and CG are 0.079 and 0.264, respectively, and they are both greater than 0.05. So, normality for both groups YPG and CG thus confirmed. The p value of the Levene test of variance equality for PEFR is 0.255 which is greater than 0.05 reveals that there were no significant variations in the variances of the post-values of YPG and CG on PEFR. Hence both groups have equal variances on PEFR values. After confirming normality and equal variances the data proceeded on independent t test. The independent t test between YPG and CG on PEFR showed p value is lesser than 0.001. Thus, it proved that both groups significantly differ at 0.001 level of confidence. In Fig 2 shows that YPG Post mean 420.28 ± 23.8 (expressed in mean ± standard deviation) is higher than CG Post mean (375.5 ± 39.85). Thus, the yogic practice significantly increased PEFR value.

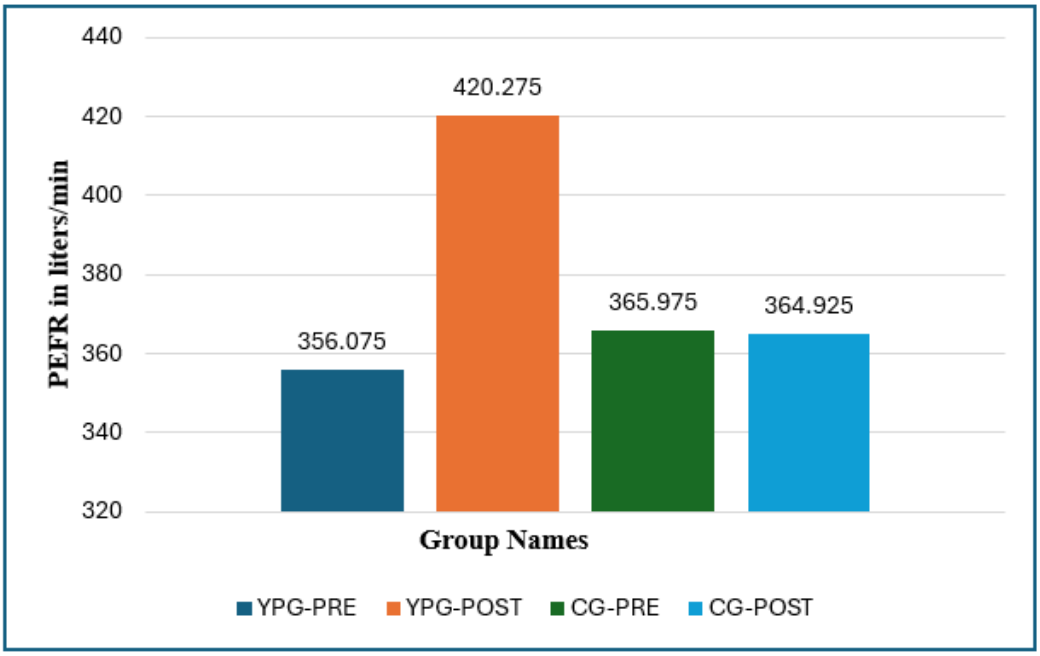

Figure 2: Mean values of PEFR

The Table 3 shows the results of paired - t test which was executed between pre and post values of YPG. The normality was checked by Shapiro-Wilk Test between the pre and post values of YPG and the p value is 0.175 which is greater than 0.05. Therefore, normality was confirmed for pre and post values of YPG. After confirming normality, the data proceeded on paired t test. The paired t test showed p value is lesser than 0.001 for PEFR. Thus, it proved that YPG post values significantly differ from YPG Pre values at 0.001 level of confidence. In Fig 2 shows that YPG Post mean 420.28 ± 23.8 (expressed in mean ± standard deviation) was higher than YPG Pre mean 375.5± 39.85. Thus, the yogic practice significantly increased PEFR value.

The Table 2 shows the results of independent - t test which was executed between post values of YPG and CG. In the Shapiro-Wilk Test, the p values for YPG and CG are 0.107 and 0.127, respectively, and they are both greater than 0.05. So, normality for both groups YPG and CG thus confirmed. The p value of the Levene test of variance equality for BHT is 0.929 which is greater than 0.05 reveals that there were no significant variations in the variances of the post-values of YPG and CG on BHT. Hence both groups have equal variances on BHT values. After confirming normality and equal variances the data proceeded on independent t test. The independent t test between YPG and CG on BHT showed p value is lesser than 0.001. Thus, it proved that both groups significantly differ at 0.001 level of confidence. In Fig 3 shows that YPG Post mean 24.18 ± 2.23 (expressed in mean ± standard deviation) is higher than CG Post mean (15.5 ± 2.33). Thus, the yogic practice significantly increased BHT value.

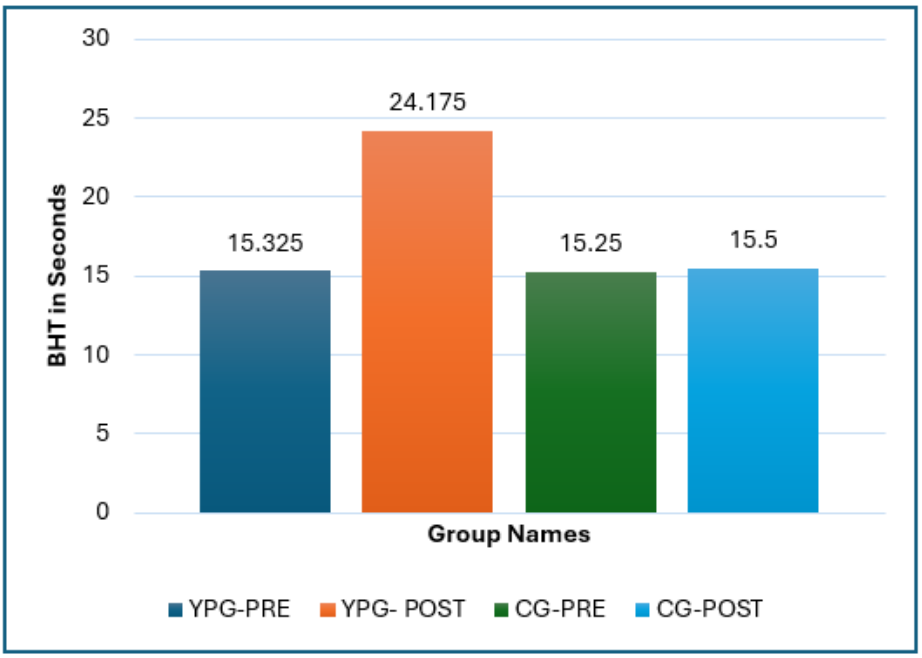

Figure 3: Mean values of BHT

The Table 3 shows the results of paired - t test which was executed between pre and post values of YPG. The normality was checked by Shapiro-Wilk Test between the pre and post values of YPG and the p value is 0.101which is greater than 0.05. Therefore, normality was confirmed for pre and post values of YPG. After confirming normality, the data proceeded on paired t test. The paired t test showed p value is lesser than 0.001 for BHT. Thus, it proved that YPG post values significantly differ from YPG Pre values at 0.001 level of confidence. In Fig 3 shows that YPG Post mean 24.18 ± 2.23 (expressed in mean ± standard deviation) was higher than YPG Pre mean (15.33 ± 2.6). Thus, the yogic practice significantly increased BHT value.

4. DISCUSSIONS

Table 2 demonstrates that the YPG had a significant improvement ($p<0.001$) in respiratory parameters including PEFR and BHT after 12 weeks of mudra practice. No significant difference was observed in the control group for PEFR and BHT. Table 3 shows significant increases between the pre and post values of study groups (YPG). As increase in PEFR from the mean pre value of 375.5 L/min to post-value of 420.28 L/min indicates that decrease in bronchoconstriction had happened after 12 weeks mudra practices. The duration of BHT increases, it shows that the breathing centers are responding less to CO2. An increase in BHT allows air to travel quickly behind the secretions while also lowering respiratory rate (reducing dyspnea) via acclimating the CO2 response (Thomas M, 2014). A 30-minute daily mudra practice can reduce stress and improve asthma symptoms. Studies have shown that slow and deep breathing exercises influence autonomic activity **(**Pal GKet al., 2004 & 2018). Dhanvijay A D, Mudra practice may have modulated the ANS due to its regulation of breathing. A previous study found that 15 minutes of mudra practice reduced heart rate, systolic and diastolic blood pressure, and blood viscosity (Tripathi D et al., 2017). A twelve weeks of yoga training was improved the PEFR among asthma patients. (Joshi, N & Paul, B., 2023). Bronchial muscle tone follows a circadian pattern. PEFR readings differ dramatically between normal and asthmatic persons owing to biological rhythms (de Freitas Dantas Gomes EL., 2015)**.** Sixteen weeks of Hatha yoga with Manthra chanting increased the BHT and PAQLQ (Navaneethakrishnan, M., et al., 2024). Practicing structured yoga for 30 minutes a day for three months significantly increased PEFR (Yadav, A. et al., 2024). Asthmatic children who practiced yoga for three months shown significant improvements in FVC, FEV1, FEV1/FVC, and PEFR compared to control group (Yadav, P., 2021). In this study, it is revealed that a 12-week regimen of yoga practices had significant beneficial effects on the respiratory functions like PEFR and BHT among asthma patients.

5. CONCLUSION

Hasta mudras considerably improved asthma patients' respiratory efficiency, including PEFR and BHT, following 12 weeks of mudra practice. The control group was not showing any significant difference from the criteria after 12 weeks. There was a significant difference between the study and control groups. If used consistently, this easy, affordable, non-pharmacological method may enhance lung function.

6. CONFLICT OF INTEREST

The authors have no conflicts of interest in the material presented in this article.

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