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RESEARCH ARTICLE

Impact of adjunct treatment with yoga on severity, illness score, and drug dosage in controlled asthmatic children

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ABSTRACT

Background: Regular yogic practices could be utilized for the effective management of clinical asthma. It acts by improving the airway dynamics; thus, disease severity can be controlled better. **Aims and Objectives:** This study aims to study the impact of adjunct treatment with yoga on disease severity, illness score, and drug dosage in children with controlled asthma. **Materials and Methods:** Thirty asthmatic children attending pediatric asthma clinic were taken as study participants during their controlled state. They were further divided into two Groups I and II (Group I – no any additional intervention and not practicing yoga and Group II – practicing yoga). Group II children were taught and made sure to practice yoga for 45 min every day for 6 days a week for a period of 3 months under yoga expert supervision. Quantitative evaluation of clinical variables, drug dosage, severity score, and illness score was recorded at the time of recruitment and follow-up evaluation done at 6 and 12 weeks of yoga. The data were statistically analyzed. **Results:** Asthmatic children practicing yoga had shown significant reduction in the illness score, severity of attacks, and drug dosage at 6 weeks and at 12 weeks of yoga practices. There was a significant decrease in school days lost in asthmatic children practicing yoga. **Conclusions:** By improving illness score and drug dosage in asthmatic children, yoga helped them by reducing number of asthmatic attacks and school days lost. Yoga as an adjunct treatment has beneficial effect in asthmatic children.

KEY WORDS: Asthma; Yoga; Drug Dosage; Illness Score

INTRODUCTION

"Yoga" is a term used for the physical, mental, and spiritual practices; its beginning rooted in ancient India. It was used by ancient Indian sages in a view to attain self-realization. Regular practice of yoga facilitates behavioral friendliness and empathy; imbibes self-discipline; and experiencing a sense of composure and happiness. Its physical benefits as increasing strength, endurance, and flexibility are very useful for the management of many chronic diseases. Nowadays, widespread practices of yoga are being promoted by the Government of India due to safety during practices, easy availability, low cost, and holistic approach. Further, their validation using a modern scientific methodology is also being promoted. Yoga and deep breathing have been considered the best complementary and alternative health approaches in adults by the National Institute of Health.[1] The recently concluded National Health Interview Survey found that the use of yoga in the U. S. adults increased significantly from 9.5% in 2012 to 14.3% in 2017.[2] Worldwide, yoga is being

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used in many ways for prevention and management of many chronic illnesses including diabetes mellitus, hypertension, back pain, and asthma.[3]

Asthma is a chronic inflammatory disease of airways characterized by variable degree of hyperresponsiveness and airway obstruction in susceptible individuals. The signs and symptoms of asthma in children are usually extensive and variable; these symptoms are usually reversible, sometimes spontaneously, however, with appropriate management.[4] Even after the substantial development in medical sciences, the morbidity and mortality related to asthma have actually been increasing in both developed and developing countries.[5] The complementary-alternative health approaches such as yoga as an adjunct to medical treatment for asthma need to be assessed for better management.

Many studies have reported improvement of the various disease indicators in asthmatic patients with the use of yogic practices, asana, pranayama, and controlled ventilation exercises. These studies revealed that regular practice of yoga leads to significant improvement in pulmonary functions.[6-11] On the other hand, some studies have shown no additional benefit of yogic interventions, pranayama, and breathing exercise.[12-14] Singh[11] and Thomas[15] have suggested that the usefulness of controlled ventilation exercises as yogic breathing (pranayama) in asthmatics should further be investigated. A study on the efficacy of yoga on the management of bronchial asthma demonstrated significant improvement in subjective as well as objective outcomes in bronchial asthma.[16] A 2016 review of 15 studies of yoga for asthma concluded that yoga probably leads to small improvements in quality of life and symptoms in people of asthma.[17]

The objectives of this study were to assess the role of yoga as adjunct therapy in asthmatic children, i.e., whether the addition of yoga practices in the modern medicine practices has any significant benefit in terms of their signs and symptoms of asthma, disease severity, illness score, as well as drug dosage and frequency.

MATERIALS AND METHODS

The study was conducted in the Department of Physiology and Pediatrics of Lady Hardinge Medical College and Kalawati Saran Children's Hospital, New Delhi.

The ethical permission to conduct the research was granted by the institutional committee.

The study design was quasi-experimental.

Thirty asthmatic children, attending the pediatric asthma clinic regularly for the management of asthma, were enrolled for the study. They were all between the age group of 10–14 years. The informed written consent from their parents was obtained before their enrollment as the study participants.

They were divided into two subgroups as Group I (n = 15) and Group II (n = 15).

Group II was assigned for practicing yoga under guidance by yoga expert for 3 months as an additional intervention to the ongoing treatment protocol being followed in the hospital, whereas Group I was not assigned any additional intervention in the ongoing treatment protocol being followed in the hospital. Both groups continued taking their usual drugs during the period of study.

All techniques of measurement and recording of the data were the same for both groups.

Diagnosis and grading of severity of asthma were done as per global initiative for asthma guidelines. Children with tuberculosis, immunodeficiency, recurrent infection, cystic fibrosis, allergic rhinitis, and eczema were excluded from the study. A thorough physical examination and clinical history were undertaken in all the study participants to exclude any chronic cardiopulmonary disease, thoracic cage abnormality, or neuromuscular disorder.

All children selected for yoga interventions (Group II) had regularly performed following yogic practices for 45 min daily for 12 weeks under the supervision of yoga expert with approximate time given as below:

1. Sukshma Vyayama (for 5 min): Breathing exercises, vaksa-sthala-shakti- vikasaka (strengthening the chest), and udara-sakti-vikasaka (strengthening the abdominal muscles)
2. Sthula Vyayama (for 3 min): Urdhva Gati and Surya Namaskar
3. Asanas (for 22 min): Shavasana, Padmasana, Vajrasana, Gomukhasana, Ardha matsyendrasana, Mandukasana, Bhujangasana, Supta Pavanamuktasana, Chakrasana, Dhanurasana, Shavasana
4. Pranayama (for 10 min): Nadi Shodhan Pranayam, Bhramari Pranayam
5. Dharna and Dhyana (for 5 min): Om meditation.

A predesigned pro forma was used to record the clinical and investigative details. The anthropometry (height, weight, and body mass index), resting heart rate, respiratory rate, and blood pressure were recorded in both groups of children.

At the initial interview, patients were instructed to keep a diary. They were told to record symptoms, its severity, and the dosage of the drugs they consumed on daily basis. They continued to take prescribed bronchodilators and/or inhaled steroids during the study. When they noticed any deterioration in their asthma symptoms, their disease status

and medications were reviewed for any change and the same was recorded this in their diaries.

At each of the follow-up visits, information from patients' diaries and from clinical examinations was recorded. The drug dosage and frequency of administration as per their requirements were noted. The following drugs were taken in consideration for assessment and comparison: (1) Short-acting beta-2 agonists (SABA) – oral and in the form of inhalers, (2) long-acting beta-2 agonists – inhalers, (3) corticosteroids – oral and inhalers, and (4) antimicrobials. Any hospitalizations during the study were also noted. A score for drug treatment was obtained by calculating the mean number of drugs (in the form of inhalers/puffs, oral tablets, and injections) taken each week for each period of follow-up.

The mean weekly number of attacks for each period of follow-up was calculated. Severity of attacks was graded: 1 = mild, but did not disturb sleep or daily routine; 2 = moderate, disturbed sleep and daily routine and was relieved by oral drugs; and 3 = severe, required injection or admission to hospital. The school days lost were asked in terms of absentees per week, which were later converted into days per year.

The illness score was calculated as per "3-point illness score for pediatric asthma" criteria: Absence of any of the symptoms was recorded as "0" score, mild, moderate, and severe symptoms were given "1–3." At each time of evaluation and illness score was calculated for every child with a maximum score of 18 and minimum of "0."

I. Cough: 1 – Brief, intermittent (<1 h/day) without appreciable discomfort; 2 – moderate, intermittent (≥1 h/day) with appreciable discomfort but able to perform daily activity; and 3 – severe cough interfering with daily activity
II. Wheezing: 1 – Infrequent, during acute exacerbation only; 2 – persist beyond exacerbations also but <3 days a week; and 3 – frequent (>3 days a week) on the most days/nights
III. Dyspnea: 1 – On moderate exertion; 2 – on day-to-day activity; and 3 – even at rest
IV. Duration of exacerbations: 1 – <3 days; 2 – <3–7 days; and 3 – >7 days
V. Night symptoms: 1 – Infrequent, during acute exacerbation only; 2 – persist beyond exacerbation also but <3 days a week; and 3 – frequent (>3 days a week) on most of the nights
VI. Drugs required: 1 – Single β-stimulant or theophylline or mast cell stabilizer; 2 – β-stimulant + Methylxanthines or with or without steroids (<7 days); and 3 – β-stimulant + Methylxanthines + steroids (>7 days).

Statistical Analysis

For each variable, mean and standard deviation of the group were calculated, and the effect of yogic practices was demonstrated with the help of statistically significant differences, according to the accepted statistical methods. Statistical significance was considered when $P < 0.05$.

- NS = No statistically significant differences
- a = Statistically significant differences between baseline and 6 weeks

Table 1: Age and anthropometric measurements of both groups (baseline)

Variables	Group I	Group II	*t*-test (I vs. II)
Age (years)	11.73±1.28	12.47±1.55	NS
Age (years) at onset of asthmatic symptoms	6.13±3.76	5.56±3.52	NS
Severity of disease			
Height (cm)	144.93±11.83	141.80±10.45	NS
Weight (kg)	40.47±10.03	38.67±7.37	NS
BMI	20.16±2.74	19.83±2.30	NS
Family H/O	4	3	-
Personal H/O of other allergies	2	2	-

NS: No statistically significant differences, a: Statistically significant differences between baseline and 6 weeks, b: Statistically significant differences between 6 weeks and 12 weeks, c: Statistically significant differences between baseline and 12 weeks. BMI: Body mass index

Table 2: Respiratory rate, heart rate, and BP of both groups (baseline, 6 weeks, and 12 weeks)

Variables	Group I	Group II	*t*-test (I vs. II)
Respiratory rate			
Baseline	25.33±3.83	23.47±4.24	NS
6 weeks	23.47±5.04	22.33±2.61	NS
12 weeks	24.67±4.51	21.27±2.72	0.041
Intragroup differences	NS	c	
Heart rate			
Baseline	85.73±13.20	85.87±10.07	NS
6 weeks	85.27±10.85	81.07±7.47	0.02
12 weeks	83.87±8.73	80.67±5.79	0.03
Intragroup differences	NS	c	
Systolic BP			
Baseline	106.67±5.98	104.00±9.97	NS
6 weeks	105.47±9.58	105.33±7.43	NS
12 weeks	109.60±7.45	108.67±9.09	NS
Intragroup differences	NS	NS	
Diastolic BP			
Baseline	65.87±5.93	62.53±7.35	NS
6 weeks	65.33±9.00	62.00±4.41	NS
12 weeks	69.20±5.06	65.87±4.69	NS
Intragroup differences	NS	NS	

NS: No statistically significant differences, a: Statistically significant differences between baseline and 6 weeks, b: Statistically significant differences between 6 weeks and 12 weeks, c: Statistically significant differences between baseline and 12 weeks. BP: Blood pressure

Table 3: Drug dosage in both groups at baseline, 6 weeks, and 12 weeks

Variables	Group I	Group II	*t*-test (I vs. II)
SABA (salbutamol [mg])			
Baseline	3.20±1.93	4.20±2.57	NS
6 weeks	4.00±2.31	3.11±2.03	0.04
12 weeks	4.00±2.83	3.20±2.68	NS
Intragroup differences		a	
LABA (salmeterol [μg])			
Baseline	62.50±53.03 (2)	64.31±25.00 (4)	NS
6 weeks	25.00 (1)	46.25±100.78 (4)	-
12 weeks	25.00 (1)	50.00±(1)	-
Intragroup differences	-	-	
Oral steroid (mg)			
Baseline	76±13.42 (6)	83.33±102.14 (5)	NS
6 weeks	-	-	
12 weeks	-	-	
Steroids (fluticasone [μg])			
Baseline	215.42±149.23 (12)	331.82±78.33 (11)	NS
6 weeks	307.50±104.12 (10)	255.56±115.09 (9)	NS
12 weeks	289.29±11.67 (7)	181.67±134.41 (6)	NS
Intragroup differences	a, b	a, b, c	
Number of medicated inhalers/puffs per day			
Baseline	1.70±0.21	1.75±0.28	NS
6 weeks	1.63±0.33	1.66±0.40	NS
12 weeks	1.50±0.30	1.49±0.28	NS
Intragroup differences	NS	c	

NS: No statistically significant differences. a: Statistically significant differences between baseline and 6 weeks, b: Statistically significant differences between 6 weeks and 12 weeks, c: Statistically significant differences between baseline and 12 weeks. SABA: Short-acting beta-2 agonists, LABA: Long-acting beta-2 agonists

- b = Statistically significant differences between 6 weeks and 12 weeks
- c = Statistically significant differences between baseline and 12 weeks.

RESULTS

The findings of the present study are depicted in Tables 1-4.

DISCUSSION

This study was conducted in 30 asthmatic children (age 10–14 years) randomly divided into two groups based on yoga as an adjunct therapy in one group. There were no any statistically differences in baseline anthropometric measurements, respiratory rate, heart rate, and blood pressure. The baseline asthma grading and severity as well as drug dosages were also similar in both groups. The group of children belonging to yoga group (Group II) had a significant decrease in illness score and drug dosage of the uses of SABA and steroids after 6 weeks and 12 weeks of yoga practices. Respiratory rate, heart rate, disease severity score, and number of inhaler/puffs used per day were significantly decreased after 12 weeks, although, no significant difference was observed after 6 weeks. The numbers of school days lost were significantly decreased after 12 weeks.

This study was in accordance to few earlier studies where the authors, Gandhi *et al*.[18] and Sathyaprabha *et al*.,[19] had reported an improvement in clinical symptomatology and reduced illness score as well as drug dosage. Sodhi *et al*.[20] and Saxena and Saxena[21] reported improvement in asthma symptoms as well as improved airway dynamics in asthmatic patients. The improvement in clinical symptoms and reduction of severity score were also reported by Nagarathna and Nagendra in their studies done across very long duration of 54 months.[6] Although one study[14] had reported, reduced bronchodilator usage after yogic intervention in asthmatic university students, till date, none of the studies reported a change in drug dosage and frequency of drugs after yoga in asthmatic children.

This was one of a new kind of study involving the integration of yoga practices with the modern medicine side by side in asthmatic children. Children suffering from asthma are

Table 4: Disease severity and illness score in both groups at baseline, 6 weeks, and 12 weeks

Variables	Group I	Group II	*t*-test (I vs. II)
Illness score			
Baseline	8.60±1.76	9.07±1.49	NS
6 weeks	7.27±2.43	6.33±1.50	NS
12 weeks	6.60±1.88	4.93±2.09	0.029
Intragroup differences	NS	a, b, c	
Severity score			
Baseline	1.61±0.19	1.75±0.31	NS
6 weeks	1.47±0.25	1.58±0.46	NS
12 weeks	1.52±0.21	1.38±0.29	NS
Intragroup differences	NS	c	
Asthma attacks/week			
Baseline	2.38±0.05	2.41±0.59	NS
6 weeks	1.89±0.05	1.65±0.45	NS
12 weeks	2.01±0.89	1.78±0.39	0.03
Intragroup differences	NS	a	
School day lost/year			
Baseline	35.33±45.30	41.1±18.51	NS
6 weeks	31.62±12.7	32.57±20.38	NS
12 weeks	27.45±16.32	21.83±11.84	NS
Intragroup differences	NS	c	

NS: No statistically significant differences, a: Statistically significant differences between baseline and 6 weeks, b: Statistically significant differences between 6 weeks and 12 weeks, c: Statistically significant differences between baseline and 12 weeks

usually difficult to manage in primary care settings, due to neglect or unawareness of parents toward disease severity and unpredictable nature of attacks and exacerbations. All the drug dosage and frequency of drug administration were managed during whole course of study by the senior consultant; the principal investigator was only noting the changes in dosage and frequency.

Contrary to the general belief, that the children may not cooperate for practicing yoga, we found them quite enthusiastic and they were performing all the steps very efficiently, due to their good flexibility of musculoskeletal system. It was ensured from investigator's side that none of the patients had any deterioration of signs and symptoms or disease process during the whole duration of research. The limitation of this study was the small sample size in study groups and all belonging to a very limited area (address within 50 km of institute), so these statistically significant findings in result might not be very useful as overgeneralization, for all the asthmatic children belong to different geographical locations. Another limitation of this study was the age range of asthmatic children (10–14 years). Although a significant contribution of asthmatic population belongs to this age group, the very small children of age group under-5 years and 5–10 years of children are also suffering in very large number.

CONCLUSIONS

Yoga by reducing illness score and drug dosage in asthmatic children may help children to cope up better with this disorder. Therefore, it should be used as an adjunct therapy to the modern medicine in effective management of bronchial asthma in children. It should be done regularly and under the guidance of yoga expert.

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