



Effect of yoga on pulmonary functions in asthmatic children

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Abstract

Asthma is a chronic inflammatory disease of airways, characterized by increased responsiveness of trachea-bronchial tree to a multiplicity of stimuli. It is an episodic disease with acute exacerbations interspersed with symptom free period. Aim of study is to find effects of yoga on pulmonary function tests in asthmatic children. In material and methods, 30 diagnosed cases of asthma of mean age 11.47 ± 1.55 were recruited and then divided into two groups. 15 asthmatics practicing yoga and rest 15 not practicing yoga. They were taught and made to practice yoga for 45 minutes every day for 6 days a week for a period of 3 months under yoga expert supervision. Yoga includes various Asanas and pranayam. The Spirometry testing was done at baseline, 6 and 12 weeks in all subjects. The data was statistically analyzed using paired t-test. The asthmatics children practicing yoga have shown a significant increase in VC, FVC, PEFr after 12 weeks of regular yoga practices & children not practicing yoga also showed increase in VC at 12 weeks. In conclusion, thus improving pulmonary functions, yoga helps asthmatic children to cope up better with vigorous physical activities. Thus, yoga could be an important adjunct to conventional asthma therapy.

Keywords: Asthma, inflammatory disease, yoga and pulmonary functions

Introduction

Yoga is an ancient Indian culture for physical, mental, and spiritual development. The word yoga is derived from the Sanskrit word "Yug" which means 'to unite'. In our Indian philosophy, everything is permitted by "Supreme universal spirit" (paramatma or God) of which the individual spirit (jivatma) with the universal spirit (paramatma). This is considered to be the ultimate goal of human life.

The regular and faithful practice of Yoga is claimed to bestow upon the practitioner ideal health at physical, mental, emotional, social and spiritual levels. During the last four-five decades, the various techniques from the science of yoga have been the subject of scientific experimentation. They have been found to have demonstrable effects on lowering heart rate and

blood pressure, besides a beneficial effect on ventilatory status and psyche of individuals (Khanam *et al.*, 1996). Yoga has thus been found particularly effective in cure and management depressive disorders and diseases having a psychosomatic component e.g. Bronchial asthma, hypertension etc and has enabled a more holistic approach towards the patients illness, which often has multiple components (Benson and Wallace, 1972).

Studies done by several researcher showed that regular practice of yoga lead to significant improvement in pulmonary function which include increase in peak expiratory flow rate (PEFR), vital capacity (VC), forced vital capacity (FVC), forced expiratory volume one (FEV₁) maximum mid expiratory flow rate (MMEFR) (Sathyaprabha *et al.*, 2001; Nagrathna and Nagendra, 1985;

Nagendra and Nagrathna, 1986; Gandhi, 1999). Very few studies have also demonstrated the beneficial effects of yoga training on resting pulmonary function, exercise capacity (Jain, 1991). So far the studies on effects of yoga on children with bronchial asthma are few hence the present study was undertaken on effects of yoga on pulmonary functions in asthmatics children in the age group of 10- 14 years.

Material and Methods

Thirty subjects of either sex coming regularly to the institutional pediatric pulmonology clinic were selected for study. They were all between the ages of 10-14 years. The informed consent was taken from their parents before study. They were divided randomly in two different groups on the basis of simple random sampling. Then these two groups were assigned the following protocol, Group I (n=15) who were not practicing yoga and Group II (n=15) who were enrolled for practicing yoga.

The following were the selection criteria for asthmatic children, Diagnosis & grading of severity of asthma as Global Initiative for Asthma (GINA) guidelines, Children with tuberculosis, immunodeficiency, recurrent infection, cystic fibrosis were excluded from study, Children should be free from allergic rhinitis, eczema. A thorough physical examination and history was undertaken to exclude the following, any recent episode of respiratory infection, any chronic cardiopulmonary disease, thoracic cage abnormality, neuromuscular disorder.

The subject was tested on relatively empty stomach i.e. about 2 - 3 hours after a light meal. In order to alley anxiety and apprehension associated with testing, they were familiarized with the procedure & apparatus to be used. All the children were evaluated thrice, first at the beginning of the study and then they were evaluated at 6 weeks and 12 weeks of study. The following pulmonary functions were measured,

vital capacity (VC), forced vital capacity (FVC), forced expiratory volume (as % of FVC) in one sec. (FEV₁%), maximum mid expiratory flow rate (MMEFR), and peak expiratory flow rate (PEFR).

The pulmonary functions were recorded by Spirometer Datospir 110/120 developed by SIBELMED, Barcelona. The Spiro lab automatically selected the best test & the results were displayed from the main screen ongoing tests. All parameters are recorded at baseline, 6 weeks and 12 weeks of study.

The following yogic practices were performed regularly for 45 minutes daily for 6 days a week for 12 weeks under supervision of yoga expert and then at home under parents supervision. They were asked to report once a week for yoga session in the department for a period of 3 months. The duration of the yoga sessions were as follows,

Sukshma Vyayama (Micro exercises)	5 min
(Macro exercises)	3 min
Asanas (Postures)	22 min
Pranayama	10 min
Dharna and Dhyana (Om meditation)	5 min

Hypothesis

Yoga may cause an improvement in clinical symptoms, Pulmonary Functions and bronchial lability in asthmatic patients, which cannot be deciphered from the available literature study but it could due to Asanas, Pranayama leading to improvement in breathing pattern and ability to cope up with stress and tolerance to allergens.

Alterations in immune function secondary to psychological stress are thought to mediate this changes in health. Yoga by balancing sympathetic and parasympathetic limbs of autonomic activity and optimizing cortisol secretion may attenuate the immune function that is the release of chemical mediators. Chemical mediators are

important factors in pathogenesis of exercise induced asthma. Asana, pranayama and mediation through external signals (five sense organs) and internal signals (proprioceptors, viscerceptors, and chemoceptors) modulates the cerebrocortico- limbic-hypothalamus system of the brain and provide beneficial effects due to functional coupling of “Autonomic, endocrine, and somatic” responses which could be correlated with homeostatic responses set up to negate the undesirable stress effects. Thus yoga may be used as an adjunct to conventional therapy in management of bronchial asthma. Yoga by reducing exercise induced bronchial lability may help children to cope up better with vigorous physical activity.

Limitations and delimitations

This study has been carried out on a small group only and is by no means generalized. Hence we consider it to be an incentive to a further and more detailed study. Further studies are also required to formulate the clinical guidelines. Preferably a population based Double blind study should be done to set to set up the guidelines.

In our study its Contrary to the general belief that the children either may not cooperate or practice yoga; we found them quite enthusiastic, efficient and regular to perform it.

Scoring procedure

All the children in both groups (Group I and Group II) were evaluated thrice, first at the beginning of the study and then they were evaluated at 6 weeks and 12 weeks of study.

Statistical Analysis

For each variable mean and standard deviation of the group were calculated according to accepted statistical method. Inter group mean differences were tested by unpaired t- test. Changes in various parameters from the initial level to different points in time were compared with paired ‘t’ test.

Results

The asthmatics children practicing yoga have shown a significant increase in vital capacity (VC) at 12 weeks, forced vital capacity (FVC) at 6 and 12 weeks, peak expiratory flow rates (PEFR) after 12 weeks of regular yoga practices and children not practicing yoga also showed significant increase in VC at 12 weeks. The detailed result is shown in tables 1 and 2.

Discussion

Yoga is a scientific way of life which has been practiced for centuries in India with the unique aim of reaching a state of complete physical, mental and spiritual development of the individual. The baseline age, height, weight, HR, RR, BP and PFT are comparable amongst group I and group II. After practice of yoga the asthmatic children may be benefited in terms of improved pulmonary functions. Asthmatic children showed a significant increase in VC, FVC, and PEFR after 12 weeks of yoga practices .Increase in PEFR is due to decrease in airway resistance. Several studies have also reported similar increase in VC, FVC, FEV₁, PEFR and MEFR (Makwana *et al.*, 1988).

The improvement in VC and FVC may due to increased development of respiratory musculature incidental to regular practice of yogic exercise. Pranayama makes the respiratory apparatus empty and fill more completely and efficiently which is recorded in terms of increased FVC. The improvements in asthmatic children not practicing yoga are due to the conventional treatment that they were receiving. Unlike other studies in the present study there is no significant improvement in FEV₁, FEV₁% and MEFR in both patients groups at 6, 12 weeks of study. This is because in our patients the acute exacerbations are controlled before we enroll them for study. The mechanism by which yoga brings about an improvement in clinical symptoms, PFT it could due to Asanas, Pranayama leading to improvement in breathing pattern, Asana, pranayama and mediation through external signals

Table – 1. Serial Pulmonary Function Test (Lung volumes) in subjects of the both groups at 6 and 12 weeks of study.

Groups Parameters	Duration	Group I (n =15)	Group II (n =15)	Significance
VC (L)	Basal	1.78 ± .52	2.04 ± .79	NS
	6 weeks	1.85 ± .55	2.24 ±.78	NS
	12 weeks	1.97 ± .50*	2.26 ± .82*	S
FVC (L)	Basal	1.75 ± .51	2.01 ±.78	NS
	6 weeks	1.78 ± .55	2.23 ±.77*	S
	12 weeks	1.88 ± .54	2.34±.72**	S
FEV ₁ (L)	Basal	1.39 ± .33	1.69 ± .60	NS
	6 weeks	1.50 ± .54	1.71 ± .54	NS
	12 weeks	1.53 ± .54	1.73 ± .65	NS
FEV ₁ %	Basal	81.59±11.21	86.21±10.35	NS
	6 weeks	84.01±11.91	82.94 ± 9.03	NS
	12 weeks	81.05±13.42	81.46 ± 9.97	NS

Baseline Vs 6 and 12 weeks *p value < 0.05, **p value < 0.01, ***p value < 0.001.

Table – 2. Serial Pulmonary function test (Flow rates) in subjects of the two groups (I&II) at 6 and 12 wks of study.

Groups Parameters	Duration	Group I (n =15)	Group II (n =15)	Significance
PEFR (L/sec)	Basal	3.19±.80	3.57±1.41	NS
	6 weeks	3.14±.93	3.50±1.28	NS
	12 weeks	3.37±.92	4.09±1.25*	S
MEFR (L/sec)	Basal	1.89±.69	1.86 ± .88	NS
	6 weeks	1.97±.72	1.94 ± .72	NS
	12 weeks	1.91± .93	1.93 ± .72	NS

Baseline Vs 6 and 12 Weeks *p value < 0.05, **p value < 0.01. ***p value < 0.001.

(five sense organs) and internal signals (proprioceptors, visceroreceptors, and chemoceptors) modulates the cerebrocortico-limbic-hypothalamus system of the brain and provide beneficial effects due to functional coupling of Autonomic, endocrine, and somatic” responses which could be correlated with homeostatic responses set up to negate the pranayama is widely believed to be helpful in

the management of asthma, and beneficial effects of yogic methods (Singh *et al.*, 1990). Yoga has been used to treat patients with asthma for over 50 years in yoga centers in India. Goyeche *et al.* (1982) reviewed the work done in this field for about 50 years at various yoga centres of India and Japan, they have been able to show clearly the beneficial effects of yoga in bronchial asthma.

Yoga may be used as an adjunct to conventional therapy in management of bronchial asthma.

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