

Effect of Yoga on Pulmonary Function Tests in Patients of Bronchial Asthma

Dr. D. P. Pandit^{1*}, Dr. S. M. Vaidya²

¹Prof & Head Dept. of Physiology, GMERS Medical College, Civil Hospital Campus, Valsad-396001

²Retd. Prof, Dept of Physiology, Grand Medical College, Mumbai

Email: pandit_dnyanesh@yahoo.com

Subject: Physiology

Abstract

In the modern era due to the growing industrialization mankind is compelled to face to problems arising from pollution & stress. Bronchial asthma is one of the diseases in which these factors play important role. In the present day no treatment for asthma is complete. In this study the possible role of yoga therapy as an adjunct to the conventional drug therapy was evaluated. A group of thirty male patients of bronchial asthma in the age group of thirty to forty years was selected from OPD of yoga therapy centre. The height, weight & severity of the disease were comparable. The pulmonary function tests selected were FVC, FEV₁, FEV₁/FVC%, PEFR & MVV. The instrument used was medispiror i.e. computerised spirometer. The results of pulmonary function tests before & after three months of yoga therapy were compared but the improvement was not statistically significant (p value > 0.005). The results of pulmonary function tests before & after six months of yoga therapy were compared & it was statistically significant improvement. [For FVC (p value < 0.01) & for FEV₁, FEV₁/FVC %, PEFR & MVV (p value < 0.001)] It was concluded from the study that the yoga therapy is beneficial in long term & can be suggested as an adjunct to the conventional drug therapy.

Key Words: Yoga, Pulmonary Function Tests, Asthma

Introduction:

In the modern age due to growing industrialization mankind is compelled to face problems arising from pollution. The external environment encompasses a range of biologic & nonbiologic pollutants, which are indispensable in the present era. This growing air pollution is probably a significant causative factor in certain bronchopulmonary diseases¹. Bronchial asthma is one of the diseases in which air pollution possibly plays an important role in addition to hereditary trend. In asthmatics there is increased responsiveness of tracheobronchial tree to a multiplicity of stimuli^{2,3}. Many theories of

aetiopathogenesis have also pointed towards bronchial asthma being a psychosomatic disorder. The stressful life style of modern age is responsible for increased incidence of Bronchial Asthma. While describing health, W.H.O. in 1948 has defined in the preamble to its constitution that "Health is a state of complete physical, mental & social wellbeing & not merely an absence of disease or infirmity."⁴ Eberst R.M. in 1984 further added spiritual dimension to the concept of health. According to him spiritual health refers to that part of the individual which reaches out & strives meaning & purpose in life. It is the intangible

“something” that transcends Physiology & Psychology⁵. Yoga is one such approach which was widely practiced in ancient India. Yoga involves physical, mental, social, spiritual aspect of human existence⁶. Today in India as well as many other countries there are many institutions using yoga as part of therapy for patients suffering from a variety of diseases. Mear popularity of a system however, can not be a measure of its reliability. It was therefore felt the efficacy of the yogatherapy needs to be assessed by some objective tests such as pulmonary function tests. Hence the study was undertaken to evaluate the role of yoga therapy in the treatment of bronchial asthma as an adjunct to the conventional drug therapy.

Materials & methods:

A group of 30 patients of bronchial asthma was selected from the OPD of Kabirbaug math samatha, Narayan peth, Pune-30

Since age, sex, height & weight affect the pulmonary function tests following criteria were used for selection of subject⁷.

The selection criteria:

- 1) The patients were chosen from the age group of 30-40 years.
- 2) Only male patients who were having history of bronchial asthma since minimum four to maximum six years, were selected. They were on conventional drug therapy for the same period.
- 3) The heights of all the patients ranged from 160-170 cm.
- 4) The weights of all the patients ranged from 55-60 kg

The exclusion criteria:

- 1) The patients who showed only seasonal attacks
- 2) The patients who were hospitalised in the last 5 years due to severe attacks of bronchial asthma which had required ventilator support.

- 3) The patients who were having history of any other major illness viz: hypertension, diabetes mellitus, heart disease etc.
- 4) The patients who had history of smoking.

The following pulmonary function tests were performed at the time of enrolment in the yoga therapy class. They were repeated again after 3 months & 6 months of yoga therapy.

- i] Forced vital capacity [FVC]
- ii] Forced expiratory volume1 [FEV1]
- iii] Forced expiratory volume1/ Forced vital capacity% [FEV1/ FVC%]
- iv] Peak expiratory flow rate [PEFR]
- v] Maximum voluntary ventilation [MVV]

All the above tests were done at the same time of the day i.e. between 7 to 8 a.m. to avoid diurnal variation. The patients were advised to continue with their conventional drug therapy. The results of pulmonary function tests before & after yoga therapy were compared & statistically analyzed.

Patients used to perform yogasana for one hour a day. The yogic curriculum included prayers followed by chanting ‘om’, pranayama, meditation & different asanas i.e. different physical postures.

The asanas performed in the yoga therapy class were as follows.

- 1] Suptaveerasana
- 2] Suptabaddhakonasana
- 3] Vipareetdandasana
- 4] Merudandasana
- 5] Kapotasana
- 6] Sarvangasana
- 7] Shavasana.

Details about the Equipment:

The instrument used for performing the pulmonary function tests was a computerised spirometer ‘medispiror’. [Recorders & Medicare Systems: 181/5, phase-1, industrial area, Chandigarh-160002] Specifications:
Flow detection: Volume differential method
Overall accuracy: within \pm 1%

Range: 0-7 Litres
 Flow: 0-16 Litres/sec
 Printer type : thermal

A] For Forced Capacity measurement:
 The subject is asked to sit comfortably in an erect posture in a chair. He was made to inhale as deeply as possible & expire forcefully in the machine, with nose clip applied in its place. The three readings are taken at an interval of 5 minutes & the best record showing maximum efforts by

the subject is selected. FVC, FEV1, FEV1/FVC %, PEFR are recorded simultaneously.

B] For Maximum Ventilatory Volume: The subjects were asked to breath in & out through the mouthpiece as rapidly & as deeply as possible for 12 seconds. After the test is complete the readings of MVV is expressed in Litres / Minute. All the measured values are at BTPS (Body Temperature & Pressure Saturated with water vapour).

Results & Discussion:

Table I: Showing mean & standard deviation of observations before & after 3 months & after 6 months of Yogatherapy

Parameters	Before		After 3 months		After 6 months	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
FVC (L)	2.51	0.23	2.57	0.19	2.74	0.36
FEV1 (L)	1.52	0.15	1.57	0.17	1.80	0.31
FEV1/ FVC %	60.20	2.21	60.85	3.77	63.46	3.98
PEFR (L/Sec)	5.59	0.26	5.70	0.35	5.97	0.36
MVV (L/Min)	85.99	2.79	88.02	6.72	91.03	5.69

Table II: Showing results of paired 't' test

Parameters	Before & After 3 months of yoga therapy		Significance
	't' value	p value	
FVC (L)	1.31	>0.005	Not significant
FEV1 (L)	1.56	>0.005	Not significant
FEV1/ FVC %	1.23	>0.005	Not significant
PEFR (L/Sec)	1.93	>0.005	Not significant
MVV (L/Min)	1.80	>0.005	Not significant

Table III: Showing results of paired 't' test

Parameters	Before & After 6 months of yoga therapy		Significance
	't' value	p value	
FVC (L)	2.89	<0.01	Significant
FEV1 (L)	4.64	<0.001	Highly significant
FEV1/ FVC %	5.07	<0.001	Highly significant
PEFR (L/Sec)	6.22	<0.001	Highly significant
MVV (L/Min)	5.40	<0.001	Highly significant

P value > 0.05: Not significant

P value < 0.01: Significant

P value < 0.001: Highly significant

Discussion:

Our results after 6 months of yoga therapy are similar to those of the work of the done by Anilkumar⁸ et al, Nagendra & Nagarathna⁹, Jain S.C.¹⁰ et al. It may be due to similar techniques of yoga therapy, similar number of patients selected & severity of the diseases in patients selected. Our results after 6 months of yogatherapy are not similar to those of Khanam A.A¹¹. et al, Tandan M.K¹². et al, Bhole M.V¹³. Virendrasingh¹⁴ et al. It may be due to the different age groups, different asanas used, smaller number of sample size & higher severity of of the diseases in their studies as compared to our study. In our study the beneficial effects of yoga therapy in patients of bronchial asthma are probably through various mechanisms as follows.

In pranayama there is prolonged inspiration as well as expiration. This stretches the elastin & collagen fibres. Hence after pranayama practice these fibres elongate to a greater extent there by increasing the compliance of the lungs¹⁵. The surface tension of the fluid lining of the inside walls of the alveoli tends to collapse the alveoli. The surface tension is greatly reduced by surfactant¹⁶. It is claimed that the lungs inflation near to the total lung capacity which occurs during pranayama is a major Physiological stimulus for release of surfactant hence increase in lung compliance¹⁶.

Also it is observed that yoga practices for long periods cause decrease in oxygen consumption per unit work & blood lactate levels¹⁷. It indicates better oxygen delivery & improved oxygen utilization due to improved cellular respiration. Hence there is decreased demand for oxygen. As shown by Nagendra & Nagarathna, yoga therapy acts by reducing the responsiveness of the tracheo-bronchial tree¹⁸. As there is decreased responsiveness of the tracheo-bronchial tree there is less frequency of attacks in patients of Bronchial asthma¹¹.

Asanas involved in yoga therapy are different types of postures. Certain postures such as inverted postures (e.g. Sarvangasana) facilitate exhalation. Because of weight of the abdominal contents on the diaphragm & / or compression of the chest. Backward bending asanas (e.g. Kapotasana) facilitate inhalation because of the nature of the expansion of the chest. Certain twisting asanas (e.g. Merudandasana) facilitate

unilateral expansion of one side of the chest & concomitant compression of the other side. Also asanas with inverted postures (e.g. Sarvangasana) help in increased expulsion of the mucus by postural drainage¹⁹. After regular yoga practices there is improvement in skeletal muscle strength including inspiratory, expiratory muscles & abdominal muscles. So there is increase in the results of the pulmonary function tests^{16,20}.

Udupa K.N., has studied the excretion pattern of the neurohormons in the urine of the patients of bronchial asthma in the yoga clinic. Amongst the neurohormons of urinary excretion of choline, adrenaline-noradrenaline & 17 hydroxy corticosteroids were studied. They roughly indicate the turnover of Ach, catecholamines & cortisol respectively. It was found that with the clinical improvement in the patients of bronchial asthma there was decreased choline content but increased adrenalin-noradrenaline & 17 hydroxy corticosteroids content of the urine. It was concluded from the observations that yoga training given to the patients are Physiological procedures without any drug which fully correct the Biochemical deficiencies & bring them towards normal levels.

In earlier studies it was shown that yoga training helps to establish parasympathetic dominance in people practicing yoga. While the study done by Gharote M.L. et al, indicated that there was increased tendency of the patients of bronchial asthma towards sympathetic dominance after yoga therapy. According to them it may be due to the different nature of the yoga techniques practiced. Also the effects of yoga depend on the subjects chosen for the study because yoga is said to improve the functioning of the depressed system either sympathetic or parasympathetic. Thus yoga therapy helps to restore the autonomic balance through stimulating effect on internal organs.

It was also observed that there were corresponding changes in the levels of neurohormons of sympathetic & parasympathetic system. Antistress effect of yoga has been already demonstrated by many workers, showing increased rate of appearance of alpha waves in EEG, indicating a relaxed wakeful state of body & mind during meditation. This points to yoga's stabilizing effects on the nervous system. The

meditation & Shavasana are clearly associated with reduced metabolic rate. According to Nagendra & Nagarathna this deep physical & mental relaxation helps in decreasing the excessive efferent vagal activity in patients of Bronchial asthma which is recognized as the mediator of the psychosomatic mechanisms in asthma. Also because of the regular practice of yoga the subjective feeling of well being helped in improving compliance of the patients which made them to take their medicines regularly. That also helped in better control of the disease in later half of the period. The various mechanisms which might be working in yoga therapy are: stretching of elastin & collagen fibres, decreased surface tension, increased compliance of lungs, decreased oxygen consumption, decreased responsiveness of trachea-bronchial tree, postural advantage, improved skeletal muscle strength, increased secretion of corticosteroids, psychosomatic advantages etc. All these effects resulted in decreased frequency of attacks of asthma, thereby decreased compromising of the pulmonary function tests over the period.

Conclusion:

It was concluded from the present study that yoga has a beneficial effect on the patients of bronchial asthma & hence yoga therapy can be suggested as an adjunct to the conventional drug therapy for the patients of bronchial asthma. Yoga therapy may help to reduce the dosages of the drugs. This further study needs to be undertaken.

Acknowledgement:

Kabirbaug Mathsamstha, Narayan Peth, Pune-411030.

“Cite this article”

D. P. Pandit, S. M. Vaidya “Effect of Yoga on Pulmonary Function Tests in Patients of Bronchial Asthma” *Int. J. of Pharm. Res. & All. Sci.*2013; Volume 2, Issue 3,58-63

References:

1] Slonim N.B. & Hamilton H. *Respiratory Physiology*: 5th ed, The CV Mosby company, Missouri; PN 231

2] *Harrisons Principles of Internal Medicine*: 14th ed, Vol 2: Mc Graw Hill, Inc. Health Profession Division

3] Szentivany A.: The beta adrenergic theory of the autonomic abnormality in bronchial asthma, *J. Asthma*,1986;23:123-137

4] Park K.: *Textbook of Preventive & social Medicine*: 15th ed, M/s Banarasidas Bhanot:12

5] Eberst R.N.: Jr. *School of Health*, (1984); 54(3): 99-109

6] Kunalayanand swami: *Yoga therapy*, 1st ed, Central health education bureau, Directorate general of health services, Ministry of health, Govt of India, New Delhi

7] Cotes J. E.: ‘*Lung Function: Assessment & Application*’: 5th ed, 1979; Blackwell Scientific Publication

8] Anilkumar P.K., Gnankumari K. et.al: Immediate effects of pranayama in airway obstruction: *Lung India*, 1985: III, No.2: 77-81

9] Nagendra H.R., Nagarathna R.: Yoga for bronchial asthma- A controlled study: *British Medical journal*, 19th Oct 1985: vol291: [1077-1079]

10] Jain S.C., Talukdar, B., Evaluation of yogatherapy programme for patients of bronchial asthma, *Singapore medical journal*, 1993, 34[4]; 306-308

11] Khanam Ayesha Akthar, Sachdeva Usha et al, study of pulmonary Autonomic functions of asthma patients after yoga training: *Indian Journal of Physiology & Pharmacology*, 1996: 40(4) : 318-324

12] Tandon M. K., Adjunct treatment with yoga chronic severe airway obstruction, *Thorax*, 1978; 33:514-517

13] Bhole M. V., Effects of yogic treatment on various lung functions of asthma patients: A pilot study; *yogamimansa*, Jan, 1982: volXX, No.4:43-50

14] Virendrsingh, Antoni Wisniewski, et al, Effect of yoga breathing exercises on airway

reactivity in subjects with asthma; Lancet, June 9, 1990; Vol. 335: 1381-83

15] Joshi K.S.; Yoga & pranayama; Vision books Pvt. Ltd., Bombay

16] Joshi L.N., Joshi V.D., et al, Effect of short term pranayama practice on breathing rate & ventilator functions of lung; Indian journal of Physiology & Pharmacology; April 1992, 36(2): 105-108

17] Raju P.S., S. Madhavi, et al, Comparison of effects of yoga & physical exercise in athletes; IJMR; Aug 94(100): 81-87

18] Nagendra H.R., Nagarathna R.: Yoga for bronchial asthma- A controlled study: British Medical Journal, 19th Oct 1985; vol 291: 1077-1079

19] Swami Shankar Devanand Saraswati (MBBS); Asthma & Diabetes; ed. 4th; Bihar school of yoga; Munger; Bihar; India

20] Madan Mohan, Thombare D. P., et al; Effect of yoga training on reaction time, respiratory endurance & muscle strength: Indian journal of Physiology & Pharmacology; 1992; 36(4): 229-233

21] Udupa K. N.: Stress & its management by yoga: 2nd revised & enlarged ed, 1985: Motilal Banarasidas Bunglow rd, Delhi, 110007.

22] Wenger M.A. & Bagachi, B.K.: A report on Psychophysiological investigations in India: Pvt circulation, 1960.

23] Gharote M.L., Bhole M.V, et al, effect of yoga treatment on autonomic balance in asthmatics: A pilot study: Yogamimansa, April-July 83: XXII, No. 1&2; 73-79.

24] Telles S., Nagarathna, et al.; physiological changes in sports teachers following 3 months of training in yoga: Indian J Medical sciences: 1993; 47[10]: 235-238

25] Bagachi. B.K. & Wenger M.A.: Electro Physiological correlates of some yogic practices. First International congress of Neurological Sciences, Brussels, 1957: vol. III

26] Wallace R.K. (1970): Physiological Effects of Transcendental Meditation: Science, 1970; 167: 1751-1754

27] Nagendra & Nagarathna R.: Yoga for bronchial asthma- A controlled study: BMJ, 19th Oct. 1985.; Vol. 291: [1077-1079]