International Research Journal of Medical Sciences _____E- ISSN 2320 –7353
Vol. **5(1),** 8-12, February **(2017)** *Int. Res. J. Medical Sci.*

Stress and lung function parameters – role of yoga

Nemjahoi Haokip, Ningthoujam Sarada* and O. Punyabati
Department of Physiology, Regional Institute of Medical Sciences, Imphal, Manipur, India
sarada109@yahoo.com

Available online at: www.isca.in, www.isca.me
Received 30th January 2016, revised 20th January 2017, accepted 21st February 2017

Abstract

Stress exposure affects lung function parameters along with other systemic effects. Yoga practice improve lung function and decrease risk for cardiorespiratory diseases. 50 stressed Manipuri women in the age group of 18-45 years were included in this study. Stress levels were assessed using the Holmes and Rahe Stress Scale, and Computerised Spirometer Helios 401was used to record various lung function parameters both before and after three (3) months of yoga training. Paired t test and one way ANOVA were used for analysis using statistical software SPSS version 21. Out of 50 participants, 8(16%) of them were low to moderately stressed, 32(64%) were highly stressed and 12(24%) were very highly stressed. Increase in lung function parameters such as FVC (p=0.000), FEV1 (p=0.000), PEFR (p=0.000), MVV (p=0.000), MEFR25-75% (p=0.000) and decrease in FEV1/FVC (p=0.000) were observed indicating improvement in lung function. Statistically significant improvement in lung function parameters was seen in stress level 2 and 3 suggesting the significant impact yoga have on stress. Thus, yoga therapy helps in improving lung function. Therefore, yoga may be adopted as a safe method in respiratory disorders for its preventive and therapeutic effects.

Keywords: Stress, Lung function parameters, Yoga therapy.

Introduction

Stress response or the general adaptation syndrome is the sum of all non-specific, systemic reactions of the body which ensue upon long continued exposure to stress. World Health Organisation estimated that 5-10% of population suffer from depression at any one time. Hans Hugo Bruno Selye defined stress as the non-specific response of the body to stressor[1]. A stressor may be physical, chemical or psychologic in nature. Stress exposure activates the autonomic nervous system through its sympathetic branch that triggers peripheral responses, such as increased respiration, heart rate and blood pressure and allocates metabolic resources to promote defensive behavior. Stressors activate the hypothalamic-pituitary-adrenal-axis (HPA-axis) through the release of corticotrophin-releasing hormone (CRH) from the paraventricular nucleus (PVN) of the hypothalamus[2].

Pituitary adenylate cyclase-activating polypeptide (PACAP), a neuropeptide belonging to the vasoactive intestinal polypeptide / secretin/glucagon family has an ability to stimulate adenylate cyclase in anterior pituitary cells and to increase the release of pituitary hormone including corticotrophin[3]. When CRH reaches the anterior pituitary gland, it elicits adrenocorticotropic hormone (ACTH) release, which prompts glucocorticoid synthesis in the adrenal glands. Glucocorticoids are then released into the blood stream where they travel and bind to receptors throughout the body and brain. Glucocorticoids adapts an individual to the neurophysiological changes that occur during stress and helps to mobilize energy and cope with stressful experiences[2].

Negative interpersonal situations such as intimate partner violence and low perceived social support add additional vulnerability for stress and depression in women[4]. Selye's concept of eustress and distress are two different reactions to stress which can occur simultaneously or separately. Eustress is a positive cognitive response to a stressor. This type of stress is associated with positive feelings and a healthy physical state. While distress is a severe stress associated with negative feelings and physical impairments. The main factor that determines whether a stressor will cause distress or eustress is the perception and interpretation of the situation by the individual. Stress can disturb one's physical, mental, emotional and behavioral balance. It can cause autonomic imbalance and can affect heart rate, respiration, blood pressure, body temperature, metabolism, digestion, appetite, sleep, fertility, working conditions, etc[5].

If exposure to stressors continues for a longer period of time, chronic health problems can develop and can even lead to diseased states. An individual goes through three stages while suffering from stress. In alarm stage, an individual experiences overacting of the sympathetic nervous system and the whole body starts preparing itself to fight against the reason of stress. In resistance stage, the body keeps making continuous efforts to cope with stress and therefore feels run down and gets mentally and physically weak. In exhaustion stage, the stress could reach a height where the individual may fell completely exhausted and helpless[6].

Popular and academic interest in yoga for treatment of health conditions are increasing while 30 million people claim to

practice yoga for health benefit worldwide. The practice of yoga originated in India around 5000 BC. It combines specific postures (asanas), breathing techniques (pranayamas), meditative techniques (dhyanas), chants (mantras) and wisdom teachings (sutras). Yoga therapy is the process of empowering individuals to progress toward improved health and well being[7]. Yoga has been adopted as a safe and effective way to promote physical activity, improving strength, balance and flexibility as well as potential benefit for people with stress[8] and depression[9], high blood pressure, heart disease, aches and pains. Psychological symptoms and disorders (anxiety, depression), autoimmune conditions, pregnancy, weight loss can all be positively affected by yoga. Yoga has positive impact on hormone regulation by lowering cortisol levels. Yoga has influence on the sympathetic and parasympathetic activity in the autonomic nervous system. Evidence suggests the respiratory effects of pranayama, visualization and calming techniques in dhyana as well as physical movement in asanas reduce sympathetic activation, increase levels of gamma-aminobutyric acid, regulate the HPA-axis to improve outcomes in stress, mood disorders, well-being and provides anxiolytic effect[7]. Yoga affects the nervous system, making the parasympathetic nervous system more dominant and stabilizing the autonomic nervous system to enhance resistance to the effect of stress. Research shows individuals who practice yoga indeed become more resilient to stress and have a decrease risk for cardiorespiratory diseases[10].

In recent decades, major efforts have been made by yoga experts in bringing yoga knowledge to a wider public. Scientists from various fields conduct research that shows positive effects yoga knowledge and techniques can have on physical, mental and emotional health of a human, and also how its implementation may contribute to the development of humans and their potential, and thus development of the society as a whole[11].

The present study was undertaken to assess the lung functions response to yoga in a group of stressed Manipuri women and to acknowledge yoga as a safe and effective aspect of preventive and therapeutic care.

Materials and methods

The present study was a prospective study, conducted in the Department of Physiology, Regional Institute of Medical Sciences (RIMS), Imphal in collaboration with Yoga Training and Research Centre (YTRC), Imphal, after getting approval from the Institutional Ethics Committee. The study was done from January 2014 to July 2015. Fifty stressed Manipuri women in the age range of 18-45 years were included in the study. A proforma of all the subjects were maintained wherein a brief clinical information, family, menstrual, personal and dietary history were taken. Proper general and systemic examination was done and an informed written consent was obtained from the participants after explaining the purpose of the study. A questionnaire using The Holmes and Rahe Stress Scale[12] was described or given to each of the participants. The stress scale is a questionnaire consisting of 43 questions enquiring of the events that have happened to them in the past one year. Participants who scored <150 were adjudged as having low to moderate stress (stress level 1), 150-299 as moderate to high stress (stress level 2), and >300 as having very high stress (stress level 3). Levels of stress were then assessed for each of them. The study parameters were recorded at the start of yoga training and after 3 months of yoga training. The yogic practices were given by an expert for a period of 3 months, 1 hour in the morning each day for 6 days per week (Table-1). Those with past yoga training, male gender, age below 18 and above 45 years were excluded from the study.

The lung functions were recorded by means of a computerised spirometer (Helios 401 of the Recorders and Medicare System, Chandigarh) in the laboratory of Department of Physiology, RIMS. The procedure was explained to the subjects followed by a demonstration. Three (3) consecutive tests were taken with a rest of 10-15 minutes between two (2) spirometric sessions. The best results among the three (3) were recorded in the proforma. Parameters recorded were: (Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 sec (FEV_1), FEV_1/FVC%, Peak Expiratory Flow Rate (PEFR), Maximum Voluntary Ventilation (MVV), Mean expiratory flow rate at 25-75% of expiration ($MEFR_{25-75\%}$).

Statistical analysis: Statistical analysis was done using statistical software SPSS version 21. Paired t test and one way ANOVA test were used to analyze the quantitative data and to determine the p-value. A p-value of < 0.05 was used to indicate statistical significance in all the analyses and interpretations were made accordingly.

Table-1: Yogic practices given

On Monday, Tuesday, Thursday and Friday : Breathing practices – 5 minutes Instant relaxation technique – 1 minute Loosening exercise – 10 minutes Quick relaxation technique – 5 minutes Surya Namaskar – 3 minutes Asanas – 30 minutes Deep relaxation technique – 7 minutes	**On Wednesday :** Loosening exercise – 7 minutes Surya Namaskar – 3 minutes Pranayama – 50 minutes **On Saturday:** Loosening exercise – 30 minutes Quick relaxation technique – 5 minutes Surya Namaskar – 5 minutes Deep relaxation technique – 15 minutes

Results and discussion

Of the 50 women (mean age = 35.42±6.49 years), 8(16%) had stress level 1, 30(60%) had stress level 2 and 12(24%) had stress level 3 respectively (Figure-1).

Table-2 shows lung functions before and after yoga training. It depicts statistically significant improvement in lung function after yoga training.

Table-3 shows stress-related lung function changes before and after yoga training. It depicts statistically significant improvement in lung function but better result is shown by stress level 2 followed by stress level 3.

Discussion: The present study was conducted in fifty (50) stressed Manipuri women in the age range of 18-45 years. The lung function tests were carried out in the Department of Physiology, RIMS, Imphal, before the start of yoga training and after three (3) months of yoga training. Lung function tests, FVC, FEV_1, PEFR, MVV and $MEFR_{25-75\%}$ show significant increase while FEV_1/FVC show significant decrease after yoga training which indicates improvement in lung function and is in consistent with the findings of Swami G et al[13], Singh S et al[14], Sivakimar G et al[15], Sathyaprabha TN et al[16], Sodhi C et al[17], Malhotra V et al[18], Tomic T et al[19], Chinagudi S et al[20] and Rao YC et al[21].

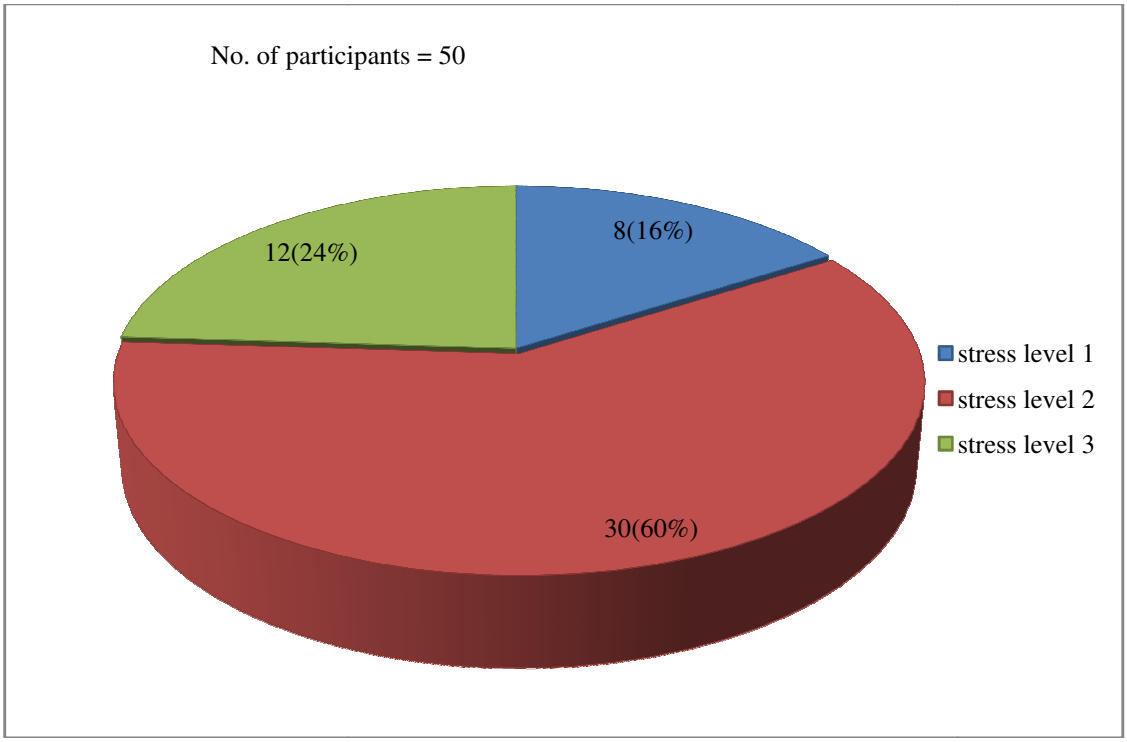

Figure-1: Stress level scoring in participants.

Table-2: Lung functions before and after yoga training.

Parameter	Before yoga (mean±SD)	After yoga (mean±SD)	p-value
FVC (liters)	2.142±0.579	2.576±0.691	0.000**
FEV_1 (liters)	1.813±0.602	2.058±0.657	0.000**
FEV_1/FVC (%)	85.568±9.046	77.870±10.565	0.000**
PEFR (L/sec)	4.063±1.792	4.812±1.994	0.000**
MVV (L/min)	70.057±22.418	77.809±28.515	0.000**
$MEFR_{25-75\%}$ (L/sec)	1.989±0.633	2.485±0.665	0.000**

**indicates highly significant ($p<0.05$) value.

Table-3: Stress-related lung function changes.

Tests	Stress level	No. of cases	Before yoga (mean) A	After yoga (mean) B	Mean diff. (B-A)	p-value
FVC (L)	1	8	2.119	2.660	0.541	0.001*
	2	30	2.127	2.560	0.433	0.000**
	3	12	2.194	2.562	0.368	0.000**
FEV_1 (L)	1	8	1.661	1.934	0.273	0.002*
	2	30	1.859	2.079	0.220	0.000**
	3	12	1.801	2.091	0.290	0.000**
FEV_1/ FVC (%)	1	8	83.404	74.071	-9.333	0.000**
	2	30	87.854	80.380	-7.475	0.000**
	3	12	81.293	74.128	-7.165	0.000**
PEFR (L/sec)	1	8	3.566	2.266	0.700	0.003*
	2	30	4.486	5.275	0.789	0.000**
	3	12	3.335	4.018	0.683	0.005*
MVV (L/min)	1	8	62.186	69.944	7.758	0.034*
	2	30	70.079	77.766	7.687	0.000**
	3	12	75.252	83.160	7.908	0.000**
$MEFR_{25-75\%}$ (L/sec)	1	8	1.566	2.005	0.439	0.001*
	2	30	2.052	2.551	0.500	0.000**
	3	12	2.114	2.642	0.528	0.000**

**indicates highly significant and *indicates significant ($p<0.05$) value.

Conclusion

Result indicates improvement in lung function after yoga training more so in stress level 2 and 3 implicating the beneficial effect of yoga on lung function. Thus, it can be concluded that yoga have significant role in combating various forms of stress an individual might encounter in day-to-day life. Therefore, yoga can provide health benefits in one's life through its preventive as well as curative aspects.

References

1. Szabo S., Tache Y. and Somogyi A. (2012). The legacy of Hans Selye and the origins of stress research: A retrospective 75 years after his landmark brief "Letter" to the Editor of Nature. *Stress*, 15(5), 472-478.

2. Raio C.M. and Phelps E.A. (2014). The influence of acute stress on the regulation of conditioned fear. *Neurobiology of Stress*, New York: Elsevier Inc., 1, 134-146.

3. Tsukiyama N., Saida Y., Kakuda M., Shintani N., Hayata A., Morita Y., Tanida M., Tajiri M., Hazama K., Ogata K., Hashimoto H. and Baba A. (2011). PACAP centrally mediates emotional stress-induced corticosterone responses in mice. *Stress*, 14(4), 368-375.

4. Kinser P.A. and Lyon D.E. (2014). A conceptual framework of stress vulnerability, depression, and health outcomes in women: potential uses in research on complementary therapies for depression. *Brain and Behavior*, 4(5), 665-674.

5. Kupriyanov R. and Zhdanov R. (2014). The Eustress Concept: Problems and Outlooks. *World J Med Sci,* 11(2), 179-185.

6. Balaji D.P.V. (2012). Stress and Yoga. *J Yoga Phys Ther,* 2(2), http://dx.doi.org/10.4172/2157-7595.1000109.

7. McCall M.C. (2013). How Might Yoga Work? An Overview of Potential Underlying Mechanisms. *J Yoga Phys Ther,* 3(1), 1-6. http://dx.doi.org/10.4172/2157-7595.1000130.

8. Pignata S. and Winefield A.H. (2015). Stress-reduction Interventions in an Australian University: A case Study. Stress and Health, 31(1), 24-34.

9. Field T., Diego M., Delgado J. and Medina L. (2012). Yoga and Social Support Reduce Prenatal Depression, Anxiety and Cortisol. *J Yoga Phys Ther,* 2(5), 1-5. http://dx.doi.org/10.4172/2157-7595.1000124.

10. Jellesma F.C. (2013). Stress and Yoga in children. *J Yoga Phys Ther,* 3(3), 1-3. http://dx.doi.org/10.4172/2157-7595.1000136.

11. Surlan B. (2012). Universality of yoga knowledge. *International Scientific Yoga Journal*, 2(2), 224-233.

12. Holmes T. and Rahe R. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*, 11(2), 213-218.

13. Swami G., Singh S., Singh K.P. and Gupta M. (2009). Effect of yoga on pulmonary function tests of hypothyroid patients. *Indian J physiol Pharmacol*, 54(1), 51-56.

14. Singh S., Soni R., Singh K.P. and Tandon O.P. (2012). Effect of yoga practices on pulmonary function tests including transfer factor of lung for carbon monoxide (TLCO) in asthma patients. *Indian J Physiol pharmacol*, 56(1), 63-68.

15. Sivakumar G., Prabhu K., Baliga R., Pai M.K. and Manjunatha S. (2011). Acute effects of deep breathing for a short duration (2-10 minutes) on pulmonary functions in healthy young volunteers. *Indian J Physiol Pharmacol,* 55(2), 154-159.

16. Sathyaprabha T.N., Murthy H. and Murthy B.T.C. (2001). Efficacy of naturopathy and yoga in bronchial asthma–A self controlled matched scientific study. *Indian J Physiol Pharmacol,* 45(1), 80-86.

17. Sodhi C., Singh S. and Dandona P.K. (2009). A study of the effect of yoga training on pulmonary functions in patients with bronchial asthma. *Indian J Physiol Pharmacol,* 53(2), 169-174.

18. Malhotra V., Singh S., Singh K.P., Gupta P., Sharma S.B., Madhu S.V. and Tandon O.P. (2002). Study of yoga asanas in assessment of pulmonary function in NIDDM patients. *Indian J Physiol Pharmacol*, 46(3), 313-320.

19. Tomic T., Novakovic B. and Gacic J. (2012). Effect of Yoga Similiris Practice on Pulmonary Function. *International Scientific Yoga Journal*, 2(2), 141-149.

20. Chinagudi S., Badami S., Herur A., Patil S., Shashikala G.V. and Ankad R. (2014). Immediate effect of short duration of slow deep breathing on heart rate variability in healthy adults. *National Journal of Physiology, Pharmacy & Pharmacology,* 4(3), 233-235.

21. Rao Y.C., Kadam A., Jagannathan A., Babina N., Rao R. and Nagendra H.R. (2014). Efficacy of naturopathy and yoga in bronchial asthma. *Indian J Physiol Pharmacol*, 58(3), 232-238.