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A Study on the Effect of Yoga on Cardiovascular System in Stressed Manipuri Women

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Abstract: *Stress can cause activation of the sympathetic division of the autonomic nervous system leading to autonomic imbalance. This can affect cardiovascular function and lead to increased risk of development of cardiovascular diseases.Yoga can modulate the autonomic balance and improve the cardiovascular function. Our study aims to assess the effect of yoga on cardiovascular function in a group of stressed Manipuri women.50 stressed women in the age range of 18 – 45 years were included in this prospective study. Stress levels were assessed by using the Holmes and Rahe Stress Scale. Cardiovascular function was assessed by recording resting heart rate(HR), resting systolic and diastolic blood pressures(SBP and DBP), heart rate response to standing(30:15 ratio) and heart rate response to Valsalva maneuver(Valsalva ratio,VR) both before and after 3 months of yoga training. Out of the total 50 women, 8(16%) had stress level 1, 30(60%) had stress level 2 and 12(24%) had stress level 3. There was a highly significant (p=0.000) reduction in the resting HR and resting SBP and DBP after yoga training while the 30:15 ratio and the Valsalva ratio showed a highly significant(p=0.000) increase after yoga training. The findings of this study showed that there is an improvement in cardiovascular function following yoga training in all levels of stress.*

Keywords*: Stress, autonomic nervous system, cardiovascular function, yoga*

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I. Introduction

Stress has been implicated in human disease processes, physical or psychological[1].Stress has been defined by Hans Bruno Syle as the non-specific response of the body to stressor which may be physical, chemical or pschologic in nature. Stress response involves almost every organ system and is the sum of all non-specific systemic reactions of the body which ensue upon long continued exposure to stress [2].

Stress promotes release of hormones and neurotransmitters that can exert a powerful influence on brain function and behavior. It activates the sympathetic division of the autonomic nervous system producing peripheral responses such as increased respiration, heart rate and blood pressure. It also activates the hypothalamo-pituitary-adrenal (HPA) axis through the release of corticotrophin releasing hormone (CRH) from the hypothalamus. This triggers the systemic release of glucocorticoids that work in a synergistic manner with catecholamines to potentiate their effects[3].When there is continued stress, impairment in neuronal function and other regulatory mechanisms tend to occur. Stress can cause autonomic imbalance which can affect heart rate, blood pressure, respiration, digestion, metabolism etc.[4,5]. Thus, long term exposure to stress can lead to development of chronic health problems and diseased states[6].

Yoga is an ancient practice which originated in India. It combines specific postures(asanas), breathing techniques(pranayamas), meditative techniques(dhyanas), chants(mantras) and wisdom teachings(sutras)[7]. Research conducted by scientists from various fields have shown the positive effects that yoga can have on the physical, mental and emotional health of a human being[8]. Yoga has a positive impact on the HPA axis by lowering cortisol levels. It also has influence on the sympathetic and parasympathetic activity in the autonomic nervous system. There are evidences which suggest that yoga reduce sympathetic activation, increase the level of gamma-amino butyric acid, regulate the HPA axis to improve outcomes in stress, mood disorders and also provide anxiolytic effects[7].Yoga also stabilizes the autonomic nervous system to enhance resistance to the effect of stress. Research have shown that individuals who practice yoga become more resilient to stress and have a decreased risk for cardiopulmonary diseases[9]. Popular and academic interest in yoga for treatment of health conditions have increased in recent times. Yoga has been adopted as a safe and effective way to promote physical activity, improving strength, balance and flexibility as well as potential benefits for people with stress[10].

The present study aims to assess the effect of yoga on cardiovascular function in a group of stressed Manipuri women as the prevalence of stress is quite high in Manipur.

II. Materials and Methods

The study was a prospective study conducted in the Department of Physiology, Regional Institute of Medical Sciences, Imphal in collaboration with Yoga Training and Research Center, Kwakeithel, Imphal after getting approval from the Institutional Ethics Committee. A total of 50 stressed Manipuri women in the age range of 18 – 45 years were included in the study. Subjects with past yoga training, age below 18 years and above 45 years, pregnancy and male gender were excluded from the study.

Informed written consent was obtained from each of the subject after explaining the purpose of the study. A proforma was maintained for each subject wherein a brief clinical information, family, menstrual, personal and dietary history were taken and recorded. Proper general and systemic examinations were done and recorded in the proforma. A questionnaire using the Holmes and Rahe Stress Scale[11] was given to each of the subject to assess the level of stress.The questionnaire consist of 43 questions enquiring of stressful life events that have happened to them in the past one year. Subjects who scored < 150 were adjudged as having stress level 1, 150-299 as having stress level 2 and > 300 as having stress level 3.

The cardiovascular function was assessed by recording the resting heart rate (HR), resting blood pressure (Systolic and Diastolic BP), heart rate response to standing (30:15 ratio), heart rate response to Valsalva maneuver (Valsalva ratio, VR) before the start of yoga training and after 3 months of yoga training. The yoga training was given by a yoga expert for a period of 3 months, 1 hour in the morning each day for 6 days per week. (Table 1)

Table 1 : Schedule for yoga training

On Mondays, Tuesdays, Thursdays and Fridays : 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 techniques – 7 minutes	**On Wednesdays** : Loosening exercise – 7 minutes Surya Namaskar – 3 minutes Prayanama – 50 minutes **On Saturdays** : Loosening exercise – 30 minutes Quick relaxation technique – 5 minutes Surya Namaskar – 5 minutes Deep relaxation technique – 15 minutes

On the day of the assessment of cardiovascular function, no cigarette, other nicotine containing food products, food or drugs per oral or any other routes were permitted prior to the tests. Before recording the above parameters, the procedures were explained to the subject and the subject was asked to relax for 30 minutes. The resting HR, and resting SBP and DBP were recorded first, followed by the other parameters with a resting time of 10 minutes between each parameter.

1. **Resting heart rate (HR)**
   Apparatus : Electrocardiograph (Cardiart 108T/MK ECG machine)
   Procedure : Lead II of the ECG machine was selected for recording the heart rate.Calibration was done and maintained throughout the procedure. Tracing speed was set at 25 mm/ second. ECG was recorded in supine position during quiet breathing for a period of 1 minute. The average R-R interval was measured manually and HR was calculated (HR = 1500/ R-R interval).
2. **Resting blood pressure (Systolic and Diastolic BP)**
   Apparatus : Mercury sphygmomanometer (Diamond) , stethoscope (Litmann)
   Procedure : Systolic blood pressure(SBP) and diastolic blood pressure(DBP) were recorded with a mercury sphygmomanometer in supine position in right upper limb by auscultatory method. Three readings were taken at an interval of 15 minutes each and the average of the three values was taken.
3. **Heart response to standing (30:15 ratio)**
   Apparatus : ECG machine(Cardiart 108T/MK), timer
   Procedure : After a complete rest of 10 minutes in supine position, the ECG recording was started and the subject assumed erect posture as quickly as possible within 3 seconds with continuous recording of ECG.
   Calculation : The ration of the longest R-R interval around the 30^{th} beat to the shortest R-R interval around the 15^{th} beat after standing was calculated for the 30:15 ratio.
4. **Heart response to Valsalva maneuver (Valsalva ratio, VR)**
   Apparatus : ECG machine, timer, modified mercury sphygmomanometer (in which a mouth piece and the body tube of a 50 ml disposable syringe is connected to the tube leading to the mercury reservoir instead of the air pump)
   Procedure : The subject was instructed to exhale forcefully through the mouth piece attached to the sphygmomanometer and to maintain a pressure of 40 mm Hg in the manometer for 15 seconds. ECG was

recording was taken during the maneuver and continued for 30 seconds after the performance. The maneuver was repeated for 3 times with 5 minutes time interval of rest.

Calculation : The ratio of the longest R-R interval after stopping blowing to the shortest R-R interval during blowing was calculated. The highest ratio of the 3 maneuvers was taken as the result for the valsalva ratio.

Statistical analysis: Statistical analysis was done using SPSS ver.21. Paired t-test and one way ANOVA test were used to analyze the quantitative data. The level of significance was set at $p< 0.05$ and interpretations were made accordingly.

III. Results

The age of the study subjects range from 18 -45 years with a mean age of 35.42±6.49 years.

Table 2 shows the distribution of the study subjects according to the level of stress. Out of the total 50 women, 8(16%) had stress level 1, 30(60%) had stress level 2 and 12(24%) had stress level 3 respectively.

Table 2: Stress level scoring of subjects

Stress level	No. of subjects (n=50)
Stress level 1	8(16)
Stress level 2	30(60)
Stress level 3	12(24)

Figures within parenthesis indicate percentage

Table 3 shows the resting HR before and after yoga training. The mean resting HR before yoga training was 83.28±8.83 beats/ minute and it decreases to 76.04 ± 9.84 beats/ minute after yoga training which is highly significant(p=0.000).

Table 3 : Resting heart rate before and after yoga training

Parameter	Before yoga (mean±SD)	After yoga (mean±SD)	p- value
Resting HR (beats/min)	83.28 ±8.83	76.04 ±9.84	0.000**

** indicates highly significant (p<0.05) value

Table 4 shows the resting SBP and DBP before and after yoga training. The decrease in resting SBP from 131.36 ± 8.28 mm Hg to 124.08 ± 10.21mm Hg after yoga training is highly significant (p=0.000). The resting DBP is also decreased significantly (p=0.000) from 86.40 ± 10.7 mm Hg to 78.76 ± 11.79 mm Hg.

Table 4 : Resting systolic BP and resting diastolic BP before and after yoga training

Parameter	Before yoga (mean±SD)	After yoga (mean±SD)	p- value
Resting SBP (mm Hg)	131.36 ±8.28	124.08 ±10.21	0.000**
Resting DBP (mm Hg)	86.40 ±10.71	78.76 ±11.79	0.000**

** indicates highly significant (p<0.05) value

Table 5 shows the 30:15 ratio and the Valsalva ratio before and after yoga training. There is a highly significant increase in the 30:15 ratio from 1.01±0.133 to 1.08±0.106 after yoga training.The increase in Valsalva ratio from 1.24±0.166 to 1.40±0.234 is also highly significant.

Table 5 : Heart rate response to standing (30:15 ratio) and Valsalva ratio(VR) before and after yoga training

Parameter	Before yoga (mean±SD)	After yoga (mean±SD)	p- value
30:15 ratio	1.01±0.133	1.08±0.106	0.000**
Valsalva ratio	1.24±0.166	1.40±0.234	0.000**

** indicates highly significant (p<0.05) value

Table 6 shows the cardiovascular function in different levels of stress before and after yoga training. It depicts a statistically significant improvement in cardiovascular function after yoga training in all levels of stress.

Table 6 : Cardiovascular function in different stress levels

Parameter	Stress level	No. of cases	Before yoga (mean) A	After yoga (mean) B	Mean difference (B –A)	p- value
HR (beats/min)	1	8	86.13	79.77	-6.36	0.000**
	2	30	82.70	74.70	-8.00	0.000**
	3	12	82.83	76.04	-6.79	0.000**
SBP (mm Hg)	1	8	124.75	118.00	-6.75	0.006*
	2	30	133.80	126.93	-6.86	0.000**

	3	12	129.67	121.00	-8.66	0.000**
DBP (mm Hg)	1	8	80.25	75.25	-5.00	0.000**
	2	30	88.73	81.13	-7.60	0.000**
	3	12	84.67	75.17	-9.50	0.000**
30:15 ratio	1	8	0.926	1.061	0.135	0.019*
	2	30	1.056	1.115	0.059	0.000**
	3	12	0.966	1.043	0.077	0.000**
VR	1	8	1.223	1.339	0.116	0.003*
	2	30	1.250	1.434	0.185	0.000**
	3	12	1.228	1.354	0.127	0.000**

** indicate highly significant and * indicate significant ($p<0.05$) value

IV. Discussion

In our study conducted in 50 stressed Manipuri women, we find that the majority of the women(60%) have a scoring of stress level 2.

In the study, we observed that there is a highly significant decrease in the resting HR and the resting SBP and DBP of the participants after 3 months of yoga training. This is similar to the findings reported by Adhana R et al[12], Srivastava RD et al[13], Deepak D et a[l4] and Bharshankar et al[15].

The heart rate response to standing(30:15 ratio) and the heart response to Valsalva maneuver(Valsalva ratio) also showed a highly significant increase after yoga training. This finding relates to the findings of Mourya M et al[16] and Kiran et al[17] who also found an increase in the 30:15 ratio and Valsalva ratio.We also observed that the cardiovascular function improve significantly in all levels of stress.

These findings indicate that yoga produce a change in the sympatho-vagal balance at rest towards parasympathetic dominance[18]. There is increase in parasympathetic activity and a reduction in sympathetic activity. The reduction in sympathetic tone caused by yoga lead to a decrease in the peripheral resistance in blood vessels and a fall in blood pressure[19,20].

V. Conclusion

The present study has shown that there is improvement cardiovascular function following yoga training in all levels of stress. Thus, it can be concluded that yoga has a beneficial effect on the cardiovascular function and can play an important role in reducing the effects of stress. Therefore, we can consider adopting yoga as a safe and effective way to combat the various forms of stress in life.

References

[1]. Robson R. A Critical Assessment of the Acute Effects of Yoga and Cardiovascular Exercise on Markers of Mood and Stress. J Yoga Phys Therapy 2011; 1(4) : 105-111.
[2]. Szabo S, Tache Y, Somogyi A. The Legacy of Hans Seyle and the origins of stress research : A retrospective 75 years after his landmark brief " Letter" to the Editor of Nature. Stress 2012 ; 15(5) : 472-478.
[3]. Raio CM, Phelps EA. The influence of acute stress on the regulation of conditional fear. Neurobiology of Stress. New York : Elsevier Inc. ; 1, 2014, 134-146.
[4]. Pradeep J, Sambashivaiah S, Thomas T, Radhakrishnan R, Vaz M, Srinivasan K. Heart rate variability responses to standing are attenuated in drug naïve depressed patients. Indian J Physiol Pharmacol 2012 ; 49(1) : 89-94.
[5]. Bijoor SN, Subbalakshmi NK, Banerjee S. Cardiac Autonomic Modulation in Cance patients as assessed by Time Domain Measures of Heart Rate Variability. International Journal of Health Sciences ans Research 2015 ; 5(2) :194-198.
[6]. Stress and Yoga. J Yoga Phys Ther 2012; 2(2) : 109-113.
[7]. McCall MC. How might Yoga work? An overview of Potential Underlying Mechanisms. J Yoga Phys Ther 2013; 3(1) :130-136
[8]. Surlan B. Universality of yoga knowledge. International Scientific Yoga Journal 2012; 2(2) : 224- 233.
[9]. Jellesma FC. Stress and Yoga in children. J Yoga Phys Ther 2013;3(3): 136-138.
[10]. Pignata S, Winefield AH. Stress reduction intervention in an Australian University: A case study.
[11]. Stress and Health 2015;31(1): 24-34.
[12]. Holmes T and Rahe R. The social and readjustment rating scale. Journal of Psychosomatic Research 1967;11(2):213-218.
[13]. Adhana R, Gupta R, Dvivedi J, Ahmad S. The influence of the 2:1 yogic breathing technique on essential hypertension. Indian J Physiol Pharmacol 2013;57(1):38-44.
[14]. Srivastava RD, Jain Nidhi, Singhal A. Influence of alternate nostril breathing on cardiorespiratory autonomic function in healthy young adults. Indian J Physiol Pharmacol 2005;49(4):475-483.
[15]. Deepak D, Sinha AN, Gusain VS. A Study on Effects of Meditation on Parasympathetic Nervous System Functional Status in Mediators. International Journal of Research in Pharmaceutical and Biomedical Sciences 2012;3(2):772-779.
[16]. Bharshankar JR, Bharshankar RN, Deshpande VN, Kaore SB, Gosavi GB. Effect of yoga on cardiovascular system in subjects above 40 years. Indian J Physiol Pharmacol 2003;47(2):202-206.
[17]. Mourya M, Mahajan AS, Singh NP, Jain AK. Effect of slow and fast breathing exercises on autonomic functions in patients with essential hypertension. J Altern Complement Med 2009;15(7):711-719.
[18]. Kiran, Arora AK, Kaur D, Ghay R. Impact of meditation on autonomic nervous system – a research study. International Journal of Basic and Applied Medical Sciences 2011;1(1):144-148.
[19]. Bhimani NT, Kulkarni NB, Salvi S. Effect of pranayama on stress and cardiovascular autonomic function. Indian J Physiol Pharmacol 2011;55(4):370-377.
[20]. Nene SB, Sunandatta AR. Study of Autonomic Nervous Function in People practicing Yoga.
[21]. International Journal of Science and Research 2015;4(2):2064-2067.

[22]. Veerabhadrappa SG, Baljoshi VS, Khanapuri S, Herur A, Patil S, Ankad RB, Chinagudi S. Effect of yogic bellows on cardiovascular autonomic reactivity. J Cardiovasc Dis Res 2011;2(4):223-227.

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