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Original Research Article**Effects of short term pranayama on certain cardiovascular risk factors****Chintamani D. Bodhe^{*1}, Shailesh N. Bhave¹ and Deepali S. Jankar²**¹Department of Physiology, Govt. Medical College, Miraj, Maharashtra, India²Department of Physiology, Krishna Institute of Medical Sciences Deemed University, Karad, Maharashtra, India***Correspondence Info:**

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E-mail:- drchintamani14@gmail.com**Abstract**

Introduction: Cardiovascular disease (CVD) is one of the major causes of death in adult men and women. Cardiovascular diseases (CVD) constitute major disorders like ischaemic heart disease (IHD), hypertension (HTN) and stroke. CVD is the most common cause of death in developed countries in adult men and women. Cardiovascular disease (CVD) is clearly of pressing clinical and economic significance underscoring the need for effective primary preventive efforts that target common, modifiable risk factors. Chronic psychological stress and negative affective states contribute significantly to hypertension and dyslipidemia, and ultimately increase risk for CVD morbidity and mortality. In light of the strong influence of psychosocial factors and sympathetic activation on the development of CVD, mind-body therapies may have considerable potential in the prevention and treatment of CVD.

Material and Methods: The present study was conducted on 60 healthy volunteers (30 females and 30 males of 17-20 years of age). They performed pranayama practice daily for 10 weeks. Blood Total Cholesterol level, Blood HDL Cholesterol level, Heart Rate and Blood Pressure were recorded before and after pranayama practice.

Result: A significant decrease in heart rate and systolic blood pressure were observed while diastolic blood pressure, blood total cholesterol and HDL cholesterol levels did not show any significant change after 10 weeks of pranayama.

Conclusion: Short term practice of pranayama shows a significant decrease in heart rate and systolic blood pressure in young healthy volunteers. The effects on lipid profile need further research in terms of the age of the subjects, duration of pranayama and inclusion of yogic exercises.

Keywords: pranayama, cardiovascular disease, blood pressure, lipid profile

1.Introduction

Cardiovascular diseases (CVD) constitute major disorders like ischaemic heart disease (IHD), hypertension (HTN) and stroke. CVD is the most common cause of death in developed countries in adult men and women. In India approximately 46.9 million cases of CVD were reported in the year 2010. The mortality is 1.2 million per year.[1] IHD is likely to be the most common cause of death worldwide by 2020.[2]

Inappropriate nutrition, lack of physical activity, tobacco consumption, obesity, dyslipidemia, HTN, diabetes mellitus (DM) are the modifiable risk factors in the development of CVD. Even small changes in the risk factor level can achieve greater reduction in morbidity and mortality associated with CVD.[1] This underscores the need for primary preventive efforts to delay the onset or development of CVD.

Chronic psychological stress, sympathetic activation and enhanced cardiovascular reactivity are associated with development of HTN, dyslipidemia, DM and CVD. The use of mind-body therapies, especially yoga is on the rise in the prevention and treatment of CVD.[3] Yoga, an ancient Indian culture has the potential of relieving stress, enhance health and improve fitness[4] by improving cardiorespiratory function, lipid profile[5], sleep[6], increasing strength[7] and reducing blood pressure (BP)[8] and blood sugar level.[9]

Studies in Hatha Yoga have claimed that employment of certain breathing techniques may improve the body's visceral functions and decrease the effects of vascular-related disorders. [4]Practice of pranayama has been known to modulate cardiac autonomic status with an improvement in cardiovascular functions.[10] The beneficial effects of different pranayama are well reported and have sound scientific basis.[11]

Even though there have been numerous studies on yoga and disease, there have been few in healthy population. Again many people prefer pranayama practice and ignore yogasanas (yogic exercises) because of lack of time in today's busy lifestyle. We therefore carried out this before and after comparison study in healthy volunteers with the purpose of determining the effects of the practice of short term pranayama on Blood Total Cholesterol level (TCH), Blood HDL Cholesterol level (HDL), Heart Rate and Blood Pressure.

2. Material and Methods

The present study was conducted on 60 healthy I year M.B.B.S. students (30 females and 30 males of 17-20 years of age). This study was approved by the Ethical Committee of Government Medical College, Miraj. Pranayama practice was conducted daily under supervision of Yoga instructor

3. Result

Table 1: Comparison of Heart Rate before and after 10 weeks of pranayama in both sexes

	Before Pranayama	After Pranayama	t value
	Mean±SD(n=30)	Mean±SD(n=30)	
Male	77.3±5.42	74.8±5.50*	5.76149
Female	77.8±4.59	75.2±4.56*	5.88715

*Statistically significant (p value <0.001)

Table 2: Comparison of Systolic Blood Pressure before and after 10 weeks of pranayama in both sexes

	Before Pranayama	After Pranayama	t value
	Mean±SD(n=30)	Mean±SD(n=30)	
Male	119.0±7.12	115.9± 1.15*	7.77033
Female	120.2±6.84	117.3 ± 0.61*	6.88614

*Statistically significant (p value <0.001)

for a period of 10 weeks and observed by the research worker. The study was approved by the ethical committee of Government Medical College, Miraj.

2.1 Inclusion Criteria

Normal, Healthy, Nonsmoker, I MBBS students willing to perform pranayama.

2.2 Exclusion Criteria

Cardiovascular or respiratory illness, family history of asthma or allergic diseases, subjects performing any type of yoga or pranayama practice before this, subjects doing regular physical exercise.

Following parameters were recorded before and after pranayama practice: Blood TCH, Blood HDL, Heart Rate and Blood Pressure.

Estimation of Blood TCH, Blood HDL by Wybenga and Pileggi method.[12]

Heart rate and blood pressure were measured in the morning. Subjects were allowed to rest for 15 minutes. Measurements were done with subjects in supine position. The pulse was counted for full one minute. It was measured by palpating the right radial pulse.[13]

Blood pressure was measured indirectly by sphygmomanometry using palpatory method first followed by auscultatory method. Appearance of sound (phase 1) was taken as systolic blood pressure (SBP) and disappearance of sound (phase 5) was taken as diastolic blood pressure (DBP).[13]

The Pranayama practice consisted of Prayer, Nadishuddhi, Bhastrika, Anulom-vilom, Suryabhedan, Kapalbhathi, Bhramari (5 minutes each) and Omkar Recitation(10 minutes) with a total duration of 45 minutes.[14]

2.3 Statistical Analysis

Analysis was done by using paired 't' test. A 'p' value of < 0.001 was considered statistically significant.

Table 3: Comparison of Diastolic Blood Pressure before and after 10 weeks of pranayama in both sexes

	Before Pranayama	After Pranayama	t value
	Mean±SD(n=30)	Mean±SD(n=30)	
Male	78±5.81	77±5.18**	1.1923
Female	78±6.24	78±5.86**	1.118

**Statistically non-significant; p > 0.001 indicates that the observed value is greater than the expected value for the level of significance at 0.001. So, in this case it is not significant.

Table 4: Comparison of Blood Total Cholesterol level before and after 10 weeks of pranayama in both sexes

	Before Pranayama	After Pranayama	t value
	Mean±SD(n=30)	Mean±SD(n=30)	
Male	172.67±23.10	172.47±22.98**	0.1393
Female	172.63±14.58	172.53±15.57**	0.1249

**Statistically non-significant (p > 0.001)

Table 5: Comparison of Blood HDL Cholesterol level before and after 10 weeks of pranayama in both sexes

	Before Pranayama	After Pranayama	t value
	Mean±SD(n=30)	Mean±SD(n=30)	
Male	34.31±6.09	34.624±6.32**	-0.8175
Female	36.74±7.22	36.4123±0.74**	0.49612

**Statistically non- significant ($p > 0.001$)

Thus, in the present study a significant decrease in heart rate and systolic blood pressure were observed while diastolic blood pressure, blood total cholesterol and HDL cholesterol levels did not show any significant change after 10 weeks of pranayama.

4. Discussion

The mortality as well as the loss of quality of life associated with CVD underline the need of effective preventive strategies. These strategies must have clinical as well as economic significance. Mind-body therapies may have considerable potential in the prevention and treatment of CVD. Yoga is widely used in India in the management of HTN and DM.[3]

Though yoga focuses on various stretching exercises and breathing techniques (pranayama) with importance of cleaning the body as a whole and prevent illhealth, the beneficial effects of pranayama in altered states of health have also been proven. Considering the increased psychological stress, inappropriate nutrition and lack of physical activity in modern life, routine pranayama practice can prove useful in order to modify various cardiovascular risk factors.

4.1 Pranayama and Heart Rate

Statistically significant decrease in HR observed in our study after 10 weeks of Pranayama practice may be due to following reasons:

- 1)Increased vagal tone.
- 2)Decreased sympathetic activity.
- 3)Decreased release of catecholamine in the blood.[15] [17]

Thus, pranayama by decreasing the work load on heart can definitely increase the functional life of heart.

4.2 Pranayama and Blood Pressure

A statistically significant decrease in systolic blood pressure (SBP) observed in our may be due to following reasons:

1. Decrease in sympathetic activity (Sympathetic tone).
2. Increased parasympathetic tone
3. Decrease in stress (reduced baseline glucocorticoid level)
4. Increase in plasma melatonin level
5. Relaxation of mind[15]-[19]

Diastolic blood pressure (DBP) mainly varies with the degree of peripheral resistance[20] and heart rate. The non-significant change in diastolic blood pressure observed in the present study suggests that Pranayama might have no any immediate effect on peripheral vascular resistance or it has some role, but is obscured by a slow heart rate.

SBP is reported to be an important risk factor than DBP in development of CVD. A small reduction in SBP of even 2-3 mm Hg can produce a large reduction in the occurrence of CVD.[1] Thus, pranayama by decreasing SBP in healthy population can prove useful in the prevention of CVD.

4.3 Pranayama and Blood Cholesterol Level

In present study there was no significant change in TCH and HDL after 10 weeks of Pranayama practice as shown in table 5.

Studies done by Prasad *et al*[21], Singh *et al*[22], Sahay *et al*[23] and Bijlani *et al*[24] have reported a significant rise in the HDL and fall in TCH. The improvement in the lipid profile after yoga could be due to increased hepatic lipase and lipoprotein lipase at cellular level, which affects the metabolism of lipoprotein and thus increase uptake of triglycerides by adipose tissues.[22]

However most of these studies done previously have been done on patients or normal subjects of higher age groups in whom the lipid profile was deviated from the normal values.

The reasons why we could not get similar results in our study could be:

- Younger age of the subjects - the TCH and HDL levels are unlikely to be deviated from normal in this age group
- All volunteers were healthy
- Relatively short duration of the study
- The subjects practiced only Pranayama.

Cholesterol is a major risk factor in the development of CVD, while HDL is protective against CVD. Again, a small change in lipid profile can have tremendous influence on the morbidity and mortality associated with CVD. [1]

Research indicates that pranayama is helpful to improve lipid profile, anthropometric indices and blood pressure in both healthy population and patients. The other beneficial effects of pranayama are improvement in coagulation profile and reduction is oxidative stress. Thus, yoga has several benefits in the preventive as well as treatment of CVD.[25] Inculcating the habit of regular pranayama early in life will definitely have favorable effect on cardiovascular factors.

There is need of a large scale study to find the benefits of pranayama on CVD risk factors

especially in healthy volunteers and in prevention of CVD. Literature suggests that starting yoga early in life definitely helps prevent cardiovascular disease. Whether addition of practice of yogic exercises (yogasanas) could have added to the benefit needs further research.

5. Limitations

Small study group, healthy volunteers, younger age group, probably of relatively high socioeconomic status, their blood cholesterol levels were least deviated from normal, relatively short duration of the study are the limitations of our study.

6. Conclusion

Short term practice of pranayama shows a significant decrease in heart rate and systolic blood pressure in young healthy volunteers. The effects on lipid profile need further research in terms of the age of the subjects, duration of pranayama and inclusion of yogic exercises.

References

- [1] Park K. Park's Textbook of Preventive and Social Medicine. 22nd Ed, Ch6:337-343.
- [2] Longo, Fauci, Kasper, Hausen, Jameson, Loscazo. Harrison's Principles of Internal Medicine. 18th Ed, Ch 241:1983-92.
- [3] Isomaa B. A major health hazard: the metabolic syndrome. *Life Sci* 2003; 73: 2395-411.
- [4] Wenger, M. A., & Bagchi, B. K. Studies of autonomic functions in practitioners of yoga in India. *Behavioral Science*, 1961; 6: 312-323
- [5] Chodzinski Jennifer. The Effect of Rhythmic Breathing on Blood Pressure in Hypertensive Adults. *Journal of Undergraduate Research* 2000; 1(6).
- [6] Chadha S, Radhakrishnan S, Ramachandran K, Kaul U, Gopinath N. Coronary heart disease in Urban Health. *Indian J Med Res* 1990; 72:424-30.
- [7] Gadegbeku CA, Dhandayuthapani A, Sadler ZE, Egan BM. Raising lipids acutely reduces baroreflex sensitivity. *American Journal of Hypertension* 2002; 15: 479-85
- [8] Virginia Grupp. Practicing Yoga, Preventing Disease PRF 810 Research Enhancement and Performance Enhancement, December 1, 2006 Available at http://www.alaskafit.com/file_archive/
- [9] Garfinkel M, Schumacher HJ. Yoga.Rheum Dis Clin N Am 2000; 26: 125-32.
- [10] Sharma Nalini, Sharma Shri Ram. Holistic insight into health promotion and HEALING in yoga. *Journal of Clinical and Diagnostic Research* [serial online] 2008 February [cited: 2008 Feb 4]; 2:690-695.
- [11] Joshi LN, Joshi VD, Gokhale LV. Effect of short term pranayam on ventilatory functions of lung. *Indian J Physiol Pharmacol* 1992; 36: 105-8.
- [12] Tietz N. 4th Ed. Fundamentals of Clinical Chemistry & Molecular diagnostics Wybenga *et al.* pg 940-42.
- [13] Swash M., Glynn M. Hutchison's Clinical Methods 22nd Ed, ch 7:76-77.
- [14] Saxena Sideswar Raj. Pranayama & its Medical benefits. PARAS Publication -1st edition-2005.
- [15] Telles S *et al.* Physiological changes in sports teachers following 3 months of training in Yoga, *Indian Journal of Medical Research* 1993; 47 (10) : 235-238.
- [16] Bharashankar Jyotsana R. Effect of Yoga on cardiovascular system in subject above 40 years. *IJPP* 2003; 47 (2): 202-206.
- [17] Makwana K. *et al.* Effect of short term Yoga practice on ventilatory function tests. *IJPP* 1988; 32 (3): 202-208.
- [18] Gopal K. S. Effect of Yogasana & pranayama on blood pressure, pulse rate and some respiratory function. *IJPP* 197373(3): 273-276.
- [19] Kalwale P. K., Shete A. N. *et al.* Effect of different durations of Pranayama on cardiovascular parameters. *IJPP* 2006; 52(5): 159.
- [20] Udupa KN, Singh RH, and Settiwar RM. Studies on the effect of some yogic breathing exercises (pranayama) in normal persons. *Indian J Med Res* 63:1062-1065, 1975
- [21] Prasad K.V.V., Madhavi Sunita, P. Sitarama Raju, Reddy M. Venkata, Sahay B.K. and K.J.R. Murthy. Impact of pranayama and yoga on lipid profile in normal healthy volunteers. *Journal of Exercise Physiology online* 2006; 9(1): 07.
- [22] Singh Savita, Kyizom Tenzin, Singh K P, Tandon O P and Madhu S V. Influence of pranayamas and yoga-asanas on serum insulin, blood glucose and lipid profile in type 2 diabetes. *Indian Journal of Clinical Biochemistry* 2008; 23 (4): 365-368.
- [23] Sahay BK. Role of Yoga in Diabetes *JAPI* 2007; 55: 121.
- [24] Kochupillai Vinod & Bhardwaj Narendra. Therapeutic Lifestyle Changes for Management of Chronic Health Problems. CME on Therapeutic Life style Changes for Management of Chronic Health Problems available at <http://www.ibtdrc.org/National%20Symposium%20202006/Proc%20pages/CMA/CMA1.pdf>
- [25] Genest J Jr., Cohn JS. Clustering of cardiovascular risk factors: Targeting high-risk individuals. *Am J Cardiol* 1995; 76:8A-20A.