

A Comparative Study of the Effects of Select Yogic Exercises on Cardiovascular Parameters in Patients with Hypertension

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Abstract

Hypertension, also known as high or raised blood pressure (BP) is a global public health challenge. Hypertension (HPT) is defined as a condition wherein blood pressure (BP) is persistently elevated with systolic blood pressure (SBP) ≥ 140 mm Hg and/or diastolic blood pressure (DBP) ≥ 90 mm Hg. It is aptly designated as the “silent killer,” because it has no specific sign and symptoms in initial stage. Yoga is an ancient Indian system for integrating mind and body that is claimed to bestow the practitioner with physical, mental, intellectual and spiritual development. Researchers have postulated that yogic relaxation and breathing techniques may reduce BP by inducing slow rhythmic proprioceptive and exteroceptive impulses, reducing peripheral adrenergic activity and facilitating autonomic balance, which reduces chemoreceptor responses and enhances baroreflex sensitivity. Our study focused towards the probable impact non-pharmacological approaches like Practicing Yoga on blood pressure control in patients with Hypertension. Our study was conducted in the Upgraded Department of Physiology, S.M.S. Medical College and Attached Hospitals, Jaipur, Rajasthan. Two sex matched groups (with and without Yoga) of hypertensive patients aged 40-60 years was constructed enrolling 60 hypertensive patients in each group. We found increase in parasympathetic activity in our study after yoga practice. Regarding BP changes, it was observed that the total peripheral resistance and average ambulatory DBP decreased significantly during meditation. The decrease in vasoconstrictor tone during the meditation might be hemodynamic mechanism responsible for reduction in diastolic blood pressure in our study. Enhancement in cardiac functions & reduction in drug doses can be achieved more effectively and rapidly with yoga.

Keywords: Blood Pressure, Intellectual and Spiritual Development, Non-Pharmacological Approaches, Yoga.

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Introduction

Hypertension (HPT) is defined as a condition wherein blood pressure (BP) is persistently elevated with systolic blood pressure (SBP) \geq 140 mm Hg and/or diastolic blood pressure (DBP) \geq 90 mm Hg. Hypertension, also known as high or raised blood pressure (BP) is a global public health challenge. Higher the pressure in the blood vessels the harder the heart has to work in the order to pump blood, thus making the heart to work too hard. It is aptly known as the “silent killer,” because it has no specific sign and symptoms in initial stage.[1]

Hypertension is one of most common cardiovascular disorder in clinical practice. Incidence of the disease are increasing day-by-day world-wide. Contributory factors for this rise, may be modern lifestyle, food habits, increase aging, metabolic diseases and stress. Age-standardized prevalence of hypertension baseline was 73.4% for man and 72% for women. Age- standardized annual incidence rate of hypertension for man was 8.6 and for women was 8.2.[2] In 2019, more than the half a million deaths in the United States had hypertension as a primary or contributing cause. The high blood pressure costs the United States about \$131 billion each year, averaged over 12 years from 2003 to 2014.[3]

Hypertension is number one health related risk factor in India, with largest contribution to burden of disease and mortality. It contributes to an estimated 1.6 million deaths annually in the India, due to ischemic heart disease and stroke. 57% of deaths related to stroke and 24% of deaths related to the coronary heart disease are related to the hypertension. Hypertension is one of commonest non- communicable diseases in India, with an overall the prevalence of 29.8% (95% CI: 26.7, 33.0) and a higher

prevalence in the urban areas (33.8% vs. 27.6%, $p = 0.05$), according to recent estimates. India’s demographic transition with an increasing proportion of the elderly people and a sedentary lifestyle and obesity associated with increasing the urbanization, and other lifestyle factors like high levels of salt intake, alcohol and tobacco consumption, are contributing to this burden of the hypertension.[4]

Alternative, less expensive methods to reduce blood pressure having comparatively low risk of drug interactions and being able to convey the benefits of long-term adherence are much needed. Yoga is one such alternative healthcare practice that can be resorted towards improving blood pressure control.[5] It incorporates specific postures, breath control exercises, meditation and specific ethical practices.[6] Lifestyle modifications include weight loss regimen, dietary recommendations and increased physical activity, all adapt towards reducing SBP by 2– 20 mm Hg but are often difficult to abide by the patients [7].

Yoga is an ancient Indian system for integrating mind and body that is claimed to bestow the practitioner with physical, mental, intellectual and spiritual development.[7] The Yoga encompasses many different paths including karma yoga (service), bhakti yoga (devotion), jnana yoga (knowledge) and raja (8 limb path of Patanjali). Hatha yoga which is the most commonly practiced yoga in the west side, emerged from raja yoga and it includes a diverse range of mind-body practices such as the meditation/relaxation techniques (Dhyana), breathing practices (pranayama) and the physical postures (asana). [8]

Researchers have postulated that yogic

relaxation and breathing techniques may reduce BP by inducing slow rhythmic proprioceptive and exteroceptive impulses, reducing peripheral adrenergic activity and facilitating autonomic balance, which reduces chemoreceptor responses and enhances baroreflex sensitivity. [9] Lifestyle modifications (LSM) are recommended as first line approach for both prehypertensive and Stage 1 hypertension patients (SBP 140–159 mmHg or DBP 90–99 mmHg) [10]. Yoga breathing-and-relaxation practices are commonly performed as an integrated practice that also includes physical postures, and such practices have been used to reduce BP and positively affect other CVD risk factors, such as obesity, lipid profile, and glycemic control. [11-16]

In recent years, the hatha yoga has become increasingly very popular for dealing with stress, improving quality of life, treating a number of the psychiatric and psychosomatic disorders, and improving psychological function. Yoga practices are now advocated for the symptomatic treatment of stress-induced disorders such as insomnia, anxiety, depression, and bronchial asthma. [17-20]

Materials & Methods

The study was conducted in the Upgraded Department of Physiology, S.M.S. Medical College and Attached Hospitals, Jaipur, Rajasthan. after obtaining ethical approval from the Institutional Ethical Committee. Data collection was commenced after the approval of research plan by the Institutional Research Review Board and proceeded till may 2022. After data collection, a further 3-month period was taken up for dissertation writing. Hypertensive patients visiting the Out Patient Department of Medicine specialty of S.M.S. Medical College and attached Hospital Jaipur. Two sex matched groups (with and without Yoga) of hypertensive

patients aged 40-60 years was constructed enrolling 54 hypertensive patients in each group (round off 60), which is being calculated at 95% confidence & 80% power to verify the expected difference of 1.7 ± 3.1 mm of Hg in ventricular systolic BP between the two study groups. 3 months of yoga training was given to the subjects (who were enrolled under the Yoga Group) at the Yoga O.P.D. (Department of physiology, S.M.S. Medical College, Jaipur) at Dhanvantri OPD block in the morning hours for 45 minutes completing a set of select yogic exercises for 5 days in week. Yoga training was given by a trainer, trained in Yogasana's, Patients enrolled under yoga group, were advised to be present empty stomach for performing Yogasana's. For continuous variables: Independent sample t-test (Unpair t - test) were used. For Categorical variables: Chi square test were used. For statistical analysis, we used 3 of the most widely recognized and reputed Analysis software, namely: -SPSS (Statistical Package for Social Sciences), version 25, PRIMER version 6 & P- Value App.

Procedure of yogasna

3 months of yoga training was given to the subjects (who were enrolled under the Yoga Group) at the Yoga O.P.D. (Department of physiology, S.M.S. Medical College, Jaipur) at Dhanvantri OPD block in the morning hours for 45 minutes completing a set of select yogic exercises for 5 days in week. Yoga training was given by a trainer, trained in Yogasanas, Patients enrolled under yoga group, were advised to be present empty stomach for performing Yogasanas. The program included:

- Warming exercise (5 min)
- Sukshma yogic Vyayam
- Asanas – (15 min)
 - Shashankasana

- Makarasana
- Shavasana
- Pranayama – (15 min)
 - Kapalbhata (kriya),
 - Deergh Shwas Preksha
- Anulom Vilom
- Bhramari pranayama.
- " OM" Chanting
- Meditation (concentration) – (10 min)

Results

Following were the results of our tests and data analysis:

Table 1

	Case		Control	
	Mean	SD	Mean	SD
Mean Age	50.12	6.28	51.27	6.53
Median (Range)	50 (40-60)		51 (40-60)	
P value (Result)	0.327**			

Table-1 delineate that the p-value as 0.327. The result is non-significant at $p < 0.05$, Age distribution concurred in all groups. The mean age in case group is 50.12, Median Range 50 years (40 – 60 years) & SD is 6.28. The mean age in control group is 51.27, Median Range 51 years (40-60 years) & SD - 6.53.

Table 2

	Case		Control	
	No.	%	No.	%
Male	48	80.00	38	63.33
Female	12	20.00	22	36.66
Total	60	100.00	60	100.00
P value (Result)	0.068**			

Table-2 delineate that the p-value is 0.068. The result is non-significant at $p < .05$, Sex distribution in Case group out of 60 cases there were 48 Males (80%) & 12 were female (20%) Sex distribution in control group out of 60 controls were 38 males (63.33%) & 22 were female (36.66%).

Table 3

	Case		Control	
	Mean	SD	Mean	SD
Mean Height	1.66	0.07	1.62	0.09
Median (Range)	1.67 (1.5-1.8)		1.62 (1.5-1.8)	
P value (Result)	0.003*			

Table-3 delineate that the p-value is 0.003. The result is non- significant as p value is not $< .05$, Height distribution in Case group Mean height 1.66 and Median Range 1.67 (1.5-1.8) and SD 0.07 Height distribution in Control group Mean height 1.62 and Median Range 1.62 (1.5-1.8) and SD 0.09.

Table 4

	Case		Control	
	Mean	SD	Mean	SD
Mean Weight	68.45	6.30	67.47	5.30
Median (Range)	68 (54-85)		65.50 (60-80)	
P value (Result)	0.356**			

Table-4 delineate that the p-value is 0.356. The result is non-significant at p-value <0.05, Weight distribution in Case group Mean weight 68.45, Median Range 68 (54-85) and SD 6.30 Weight distribution in control group Mean weight 67.47, Median Range 65.50 (60-80) and 5.30.

Table 5

	Case		Control	
	Mean	SD	Mean	SD
Mean BMI	25.32	2.42	25.90	1.99
Median (Range)	25.25(20.02-29.43)		26.18(21.63-29.33)	
P value (Result)	0.151**			

Table-5 delineate that the p-value is 0.151. The result is statistically non-significant as p-value is not $p < .05$. BMI distribution in Case group Mean BMI- 25.32, Median Range-25.25 (20.02-29.43) and SD- 2.42 BMI distribution in control group Mean weight -25.90, Median Range 26.18 (21.63-29.33) and SD – 1.99.

Mean \pm SD of systolic blood pressure, in case & control group on day-1, after 1.5 months & 3 months:

Table 6

	Case		Control		P value
	Mean	SD	Mean	SD	
1 st Day	164.63	13.79	161.00	9.02	0.090
After 1.5 months	147.13	8.58	153.93	8.02	$p < 0.001^{**}$ (HS)
After 3 months	123.13	7.88	138.40	6.38	$p < 0.001^{**}$ (HS)

Table-6 exhibits that the p-value is 0.090. The result is not significant on 1st day, The p-value is <0.001. The result is statistically highly significant on after 1.5 months and 3 months. Mean \pm SD of diastolic blood pressure, in case & control group on day 1, after 1.5 months & 3 months:

Table 7

	Case		Control		P value
	Mean	SD	Mean	SD	
1 st Day	101.33	4.35	102.25	2.77	0.171
After 1.5 months	94.00	4.12	98.77	4.13	$p < 0.001^{**}$ (HS)
After 3 months	76.27	3.36	94.53	4.58	$p < 0.001^{**}$ (HS)

Table-7 delineate that the result is not significant on 1st day. The p-value is 0.171, The result is statistically highly significant after 1.5 month and after 3 months. The p-value for both is <0.001.

Discussion

It is known that stress can cause hypertension through repeated blood pressure elevations as well as by stimulation of the nervous system to produce large amounts of vasoconstrictor hormones that increase blood pressure [21], Reduction in stress after yogic practices might be other possible mechanism for reduction of BP in the present study. It is reported that yogic practices that appear to exert neuro-physiological stability is evident from lowered level of cholinesterase and catecholamine [22], It might lead to reduction in BP because lowered level of cholinesterase and catecholamines cause reduction in sympathetic activation and increase in parasympathetic activity. We also found increase in parasympathetic activity in Present study after yoga practice.

Regarding BP changes in an earlier study, it has been reported that the total peripheral resistance and average ambulatory DBP decreased significantly during meditation.[23] The decrease in vasoconstrictor tone during the meditation might be hemodynamic mechanism responsible for reduction in diastolic blood pressure in the present study. Enhancement in cardiac functions & reduction in drug doses can be achieved more effectively and rapidly with yoga.

Conclusion

From the study, it is concluded that select Yogic exercises (Warming exercise, Shukshma yogic Vyayama, asana's, pranayama's & meditation) along with Hypertensive treatment improves cardiac parameters and reduces the drug doses in hypertensive patients significantly if done regularly and effectively. Yogic exercises involve the physical, mental and spiritual task in a comprehensive manner.

Enhancement in cardiac functions &

reduction in drug doses can be achieved more effectively and rapidly with yoga as per the present study.

Limitations

In the present study, the small size of the sample population is also a limiting factor. Thus, A further study with a larger study population is recommended to address the above –said issue more conclusively.

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