

## Beneficial effects of yoga on cardiovascular parameters in hypertensive patients

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### Abstract

The Yoga is an art of developing mental and physical health of the body. The study was done on 30 hypertensive male patients undergoing the treatment since 3-17 years. The basal recording of cardiovascular parameters like Blood Pressure [Diastolic and systolic], Heart Rate, Pulse Pressure and Rate Pressure Product were taken. After that, they were given the training of yoga exercises like Shavasana and Pranayama by a trained teacher for every 6 days of 6 weeks. Then again the recordings of the cardiovascular parameters were taken. It was found that there was a statistically significant decrease in all the cardiovascular parameters. The yoga exercise shows a strong tendency to improve the Autonomic Nervous System through enhanced parasympathetic nervous system and leading to decrease in the sympathetic tone in the skeletal muscle blood vessels. Thus by these results, it can be concluded that the yogic exercises can be treated as an alternative therapy for reducing stress disorders in persons suffering from essential hypertension.

**Key words:** Yoga pranayama Shav asana Hypertension Cardiovascular parameters

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### Introduction

The word 'Yoga' is derived from the Sanskrit word 'Yuj' which means "concentrate one's attention on." Yoga is an ancient art that is defined as the union of soul with god [Anand].<sup>1</sup> Yoga and health are connected with each other very closely. Yoga helps not only in physical health but also in mental health providing positive thinking and spiritually to both our mind and body. It comprises of Asanas [Yoga postures], Yoga breathing [Pranayama] and meditation which makes our body flexible by taking out our mental stress and being yourself in a relaxed position. It is of four types- Raj Yoga, Karma Yoga, Jnana Yoga and Bhakti Yoga. The Raj Yoga consists of eight steps and each involves self-control, muscle relaxation postures, breath control, concentration and deep meditation. Three out of eight steps are most common in the Western period: Pranayama, Asana and Dhayana [Mishra].<sup>2</sup> Pranayama is the principle of development and sustenance of the nervous and cellular tissues of the body and the mind [Bhaduri S].<sup>3</sup> It is a systemic regulation of both the inhalation and exhalation. Dhyana Yoga produces a state of tranquility. Its objective is to cleanse the subconscious, develop the concentration, clear the mind and bring about various stages of unifies communion with god [Vivekananda Swami].<sup>4</sup> High blood pressure describes the high force of blood against artery walls. Recent international hypertension guidelines have also created categories below the hypertensive range to indicate a continuum of risk with high BP in the normal range. JNC VII<sup>5</sup> uses the term pre-hypertension for blood pressure in the range 120-139 mmHg systolic and/or 80-89 mmHg diastolic. A number of factors increase BP, including obesity, insulin resistance, high alcohol intake, high salt intake, aging, stress, low potassium intake, low calcium intake and sedentary lifestyle.<sup>6</sup> Cardiovascular diseases caused 2.3 million deaths in India in the year

1990; this is projected to double by the year 2020 [R.Gupta].<sup>7</sup> In fact, hypertension is the most prevalent chronic disease in India. Stage I hypertension [systolic BP 140-159 mmHg and/or diastolic BP 90-99 mmHg] carries a significant cardiovascular risk and there is a need to reduce this BP. Yoga, a practice of controlling the mind and body is an ancient art that began in India over thousands of years ago. Because it involves breath control, meditation and physical postures, it is supposed to increase the vitality of the human body, help with concentration, calm the mind, and improve common physical ailments [Lamb].<sup>8</sup> There is evidence that Yoga is effective for prevention as well as management of bronchial asthma,<sup>9</sup> stress due to exams,<sup>10</sup> anxiety and depression,<sup>11</sup> stress in hypertensive patients<sup>12</sup> and in the cure and control of essential hypertension.<sup>13</sup> It is also known to improve the subjective well-being.<sup>11,14</sup> Rate Pressure Product [RPP] is a reliable index of myocardial oxygen demand [determinants include intramyocardial wall tension, contractility and heart rate] and cardiac work and it correlates well with the myocardial oxygen demand of normal subjects as well as patients with angina pectoris.<sup>15</sup> Earlier studies by Selvanmurthy et al<sup>16</sup> have shown that some yogic postural exercises can control essential hypertension. In non-pharmacological control of essential hypertension, a number of workers have used Shavasana and other yogic techniques for the control of essential hypertension.<sup>17,18</sup> We studied the effect on Blood Pressure [BP], Heart Rate [HR], Pulse Pressure [PP] and Rate Pressure Product [RPP] in hypertensive subjects after 6 weeks of Yoga training including Shavasana and Pranayama.

### Material and Methodology

The study design was a longitudinal study. It was conducted in Department of Physiology at Santosh Medical College in collaboration with Department of

Medicine at Santosh Hospital, Ghaziabad. The 30 male subjects attending medicine OPD of Santosh Hospital for uncomplicated essential hypertension were selected for the present study. Yogic relaxation training for the study was conducted for total duration of 6 weeks.

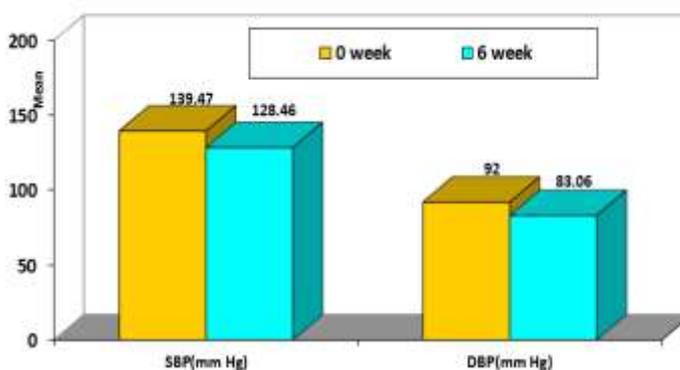
The male patients of age between 41-60 years who were taken as subjects of this study were having uncomplicated hypertension since 3-17 years and were under treatment with antihypertensive medications. After explaining purpose and procedure of the study, informed consent was obtained from the subjects in easily understandable language. Basal recordings were taken in sitting posture after 10 min of rest at 0 week. Systolic blood pressure [SBP], Diastolic blood pressure [DBP] were recorded by calibrated mercury

sphygmomanometer and ECG [BPG] lead II recorded to calculate the baseline heart rate at every alternate week during 6 months training period [0,2,4,6 weeks]. Pulse pressure [PP=SBP-DBP] and Rest Pressure Product [RPP=HR X SBP X 10<sup>-2</sup>] were also calculated. After the basal recordings of heart rate and BP at 0 week, subjects were taught yoga-asana and pranayama by a trained yoga teacher for 35 min. every day from Mon-Sat for 6 weeks which includes warm up for 10 minutes, yoga asana included Shavasana for 15 minutes and Pranayama included Savitri Pranayama and Anulom-Vilom for 10 minutes. The data was expressed as mean  $\pm$ SD and it was calculated using student as 't' test. The statistical analysis was performed and the statistically significance was defined as P<0.05.

### Observations and Results

**Table 1: Table gives comparison of mean and standard deviation of Blood pressure (systolic and diastolic pressure) at 0 week and after 6 weeks of yoga training**

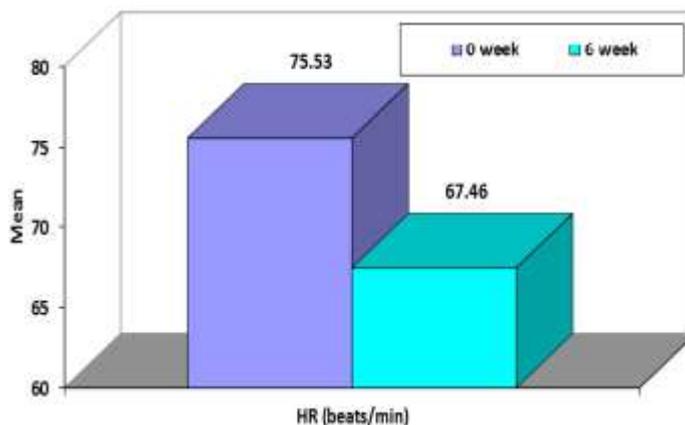
Blood Pressure	Mean+SD	Significance
SBP(mmHg)at 0week	139.47+4.39	HS*
SBP(mmHg)at 6week	128.46+3.47	
DBP(mmHg)at 0week	92.00+2.51	HS*
DBP mmHg at 6week	83.06+2.50	



\*P<0.001 HS= Highly significant

**Table 2: Table gives comparison of mean and standard deviation of heart rate at 0 week and after 6 weeks of yoga training**

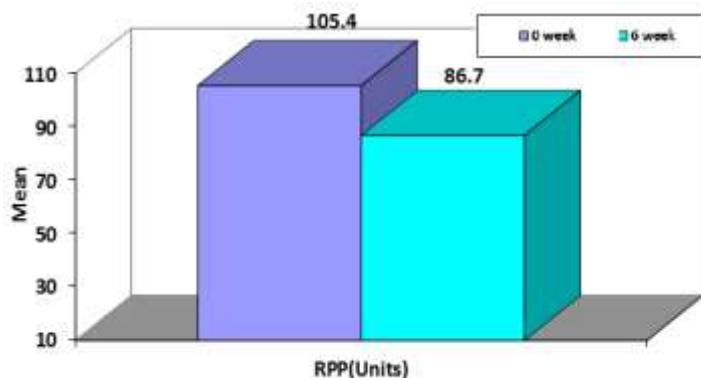
Heart Rate (HR)	Mean +SD	Significance
HR(beats/min) 0 week	75.53+2.956	HS*
HR(beats/min) 6 weeks	67.46+2.622	



\*P<0.001 HS = Highly significant

**Table 3:** Table gives comparison of mean and standard deviation of rate pressure product at 0 week and after 6 weeks of yoga training

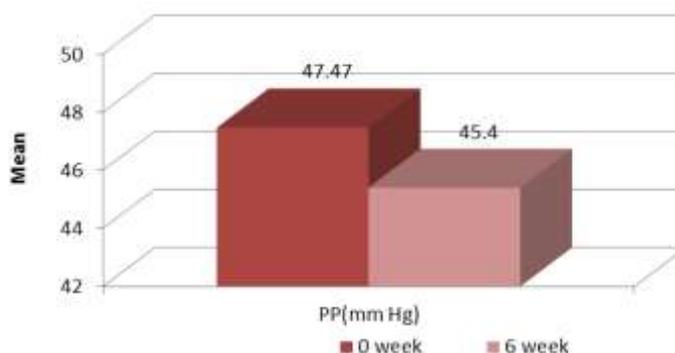
Rate pressure Product	Mean +SD	Significance
RPP(units) 0 week	105.40+6.34	HS*
RPP(units) 6 weeks	86.70+4.74	



\*P<0.001 HS= Highly significant

**Table 4:** Table gives comparison of mean and standard deviation of pulse pressure at 0 week and after 6 weeks of yoga training

Pulse Pressure (PP)	Mean+SD	Significance
PP at 0 week	47.47+3.598	HS*
PP at 6 week	45.40+2.931	



\*P<0.001 HS= Highly significant

## Discussion

In the present study, we observed statistically highly significant reduction in systolic and diastolic blood pressure after 2, 4 and 6 weeks of yoga training when compared with the basal recording of blood pressure before yoga training at 0 week. The significant decrease was associated with the improvement of baroreflex sensitivity and attenuation of sympathetic and rennin-angiotensin activity. The yoga exercise of Pranayama increases the frequency and the duration of the inhibitory neural impulses by activating the stretch receptors of the lungs during the tidal volume inhalation as in the Hering-Breuer reflex. This brings about a withdrawal of the sympathetic tone in the skeletal muscle, blood vessels, leading to widespread vasodilatation, thus causing a decrease in the peripheral resistance and thus decreasing the DBP<sup>19</sup>. The yoga practice increases the vagal tone, decreases the work load on heart leading to decrease in cardiac output and hence SBP and it also affects the hypothalamus directly and bring about decrease in blood pressure. Decreased sympathetic activity is responsible for decrease in HR which in turn reduces catecholamine secretion and also leads to vasodilatation, leading to the improvement in peripheral circulation. It also reduces BMR and resting O<sub>2</sub> consumption. The ujjayi Pranayama and Shavasana training results in a significant decrease in basal heart rate and BP. As the RPP is an index of myocardial O<sub>2</sub> consumption and the load on the heart, it also decreased significantly. The yoga exercise of Pranayama shows a strong tendency to improve the Autonomic Nervous System through enhanced activation of the parasympathetic system leading to withdrawal of sympathetic tone in the skeletal muscle blood vessels, leading to widespread vasodilatation thus causing decrease in the peripheral resistance and thereby decreasing the blood pressure. In Shavasana, the person relaxes with slow rhythmic movements of the respiratory muscles and other parts of the body. This influences the hypothalamus through a continuous feedback of the slow rhythmic proprioceptive and exteroceptive impulses to reset it at a lower level, thus reducing the blood pressure.

## Conclusion and Summary

Modern man has become a victim of daily stress and stress related disorders like hypertension, angina and insomnia. There have been several evidences to suggest that the yogic techniques are ideal for improving one's ability to withstand stressful stimuli. The comparison of mean±SD of BP, HR, PP and RPP were tabulated and thus it can be concluded that the short term yoga training can lower SBP, DBP, HR and RPP, which are statistically highly significant. The yoga practices which included Shavasana and Pranayama seem to produce a significant reduction in BP in subjects with essential hypertension. By extending these results, it can be suggested that the yoga practices may be applied as alternative therapy or as adjunct to conventional therapy in stress related diseases for long lasting changes in HR

and BP. If practiced regularly in subjects with essential hypertension.

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