

**Original article:**

## **Effect of short duration yogic techniques on cardiovascular parameters in students doing yoga**

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### **Abstract:**

Yoga is known to human being since a long time for its miraculous effects on body and mind. The mechanism by which the yoga produces its effects is a subject of great research. The present case-control study was performed in 40 1<sup>st</sup> year, apparently healthy medical students of both sexes between age group 17 to 19 years to study the effect of yoga on certain cardiovascular parameters. Students underwent 8 weeks of yoga training which included suryanamaskar, asanas, pranayam and meditation. The cardiovascular parameters like pulse rate, systolic blood pressure and diastolic blood pressure were measured and compared before and after training. We found highly significant reduction in pulse rate, systolic as well as diastolic blood pressure after the yoga training. Yoga might produce its effects through action on limbic system and brain, by decreasing sympathetic activity throughout the body and by increasing parasympathetic predominance. So adopting yoga as a part of life-style will certainly decrease the morbidity and mortality due to cardiovascular diseases.

**Key words:** Yoga, Systolic blood pressure, Diastolic blood pressure, Pulse rate

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### **Introduction:**

Yoga is an ancient technique practiced in India since thousands of years. Yoga is a technique which harmonizes the body and the mind. Swami Vivekanand had described the yoga in eight parts: Yam, Niyam, Aasanas (i.e. physical postures and exercises), Pranayam (various breathing techniques), Pratyahar, Dharana, Dhyana and Samadhi. Yoga is the art and science of healthy living. Historical evidences of the existence of Yoga were seen in the pre-vedic period, thereafter till Maharshi Patanjali's period. The information of Yoga is available in Vedas, Upanishads, Smritis, teachings of Panini, Epics, Puranas etc. In the modern age, Yoga is well known for disease prevention and cure, promotion of health and management of many life-style related disorders.<sup>(1,2)</sup> Advantages of yoga is that it is

inexpensive, easy to perform and usually without any complications.<sup>(3)</sup> Yoga is extremely useful in many diseases like cardiovascular diseases, pulmonary diseases, metabolic, endocrine, musculoskeletal diseases, menopausal symptoms, mental diseases etc.<sup>(4)</sup> Beneficial effects of yoga come through diverse means. Aasanas improve physical flexibility and fitness while pranayama result in decreased stress and enhanced awareness and quality of life.<sup>(4)</sup> Evidences suggest that Yoga decreases heart rate, blood pressure and basal metabolic rate, improves glucose tolerance and insulin sensitivity, enhances cardiovagal function, improves psychological well-being and self confidence, increases antioxidant status of the body, decreases anti-inflammatory markers, decreases pain sensation.<sup>(5,6)</sup> Prevalence of hypertension and pre-hypertension is increasing in

India in both rural and urban population. Hypertension is one of the major contributor to premature death in India by its effects on heart and brain.<sup>(7)</sup> Hypertension is also prevalent in students of medical colleges.<sup>(8,9)</sup> Sympathetic over-activity is associated with development of pre-hypertension and hypertension. Various studies<sup>(10 - 16)</sup> show that regular practices of yoga shift autonomic balance towards parasympathetic predominance reduce stress by acting on limbic system and decrease the activity of hypothalamic-pituitary-adrenal axis. As the medical students first time enter the professional studies, they are subjected to a large amount of stress and stress is responsible for sympathetic over activity and rise in blood pressure.<sup>(3,9)</sup> As even a small persistent reduction in blood pressure can have a major protective effect on cardiovascular diseases, the present study is undertaken to understand the effects of short duration yogic techniques on cardiovascular parameters (blood pressure: systolic and diastolic and pulse rate) of 1<sup>st</sup> year medical students.

**Aims and objectives:**

To study effect of short duration yogic techniques on cardiovascular parameters like pulse rate, systolic blood pressure and diastolic blood pressure in 1<sup>st</sup> year medical students.

**Materials and methods:**

The present case-control study was conducted in 40 1<sup>st</sup> year medical students (21 males and 19 females). All subjects were in the age group of 17 to 19 years.

**Selection criteria:**

**Inclusion criteria:**

- Apparently healthy students of both sexes having similar dietary habits and similar physical and mental activities were included by random sampling.

**Exclusion criteria:**

- Subjects having history of recent/remote cardiovascular and respiratory diseases like hypertension, congestive cardiac failure, respiratory allergy, emphysema, tuberculosis, diabetes and any other major diseases were excluded
- Subjects having history of tobacco use, smoking, alcohol intake were excluded.
- Students having history of any major operation in the past were excluded.
- Students doing yoga, relaxation techniques or any type of physical exercise on regular basis were also excluded from the study.
- Students taking any anti-hypertensive medication or drug interfering with activity of autonomic system were excluded from the study.
- Subjects having any physical disability like kyphoscoliosis were also excluded from the study.

Approval of the Ethics committee was obtained. Informed, written consents of all the students were also obtained.

All the students underwent daily 1 hour of yoga training, 6 times per week for 8 weeks. Timing of the yoga training was from 7 am to 8 am. One hour of yoga training included the following events:

- 🙏 10 minutes: prayer and suryanamaskar
- 🙏 15 minutes: various aasanas like mayurasan, tadasan, padpashchimottasan, sarvangasan, halasan, bhujangasan, trikonasan, shavasan etc.
- 🙏 25 minutes: various pranayamas like bhastrika, kapalbhati, bahya pranayama, anulom-vilom, bhramari.

✚ 10 minute: Meditation.

Cardiovascular parameters like pulse rate, blood pressure both systolic and diastolic were measured before and after yoga training by following way:

- ❖ Pulse rate: It was measured in right radial artery with patient in supine position after 10 minutes of physical and mental rest.
  - ❖ Blood pressure: It was measured in right arm with patient in supine position after 10 minutes of physical and mental rest.
- Blood pressure was measured by

auscultatory method with the help of mercury sphygmomanometer. Appearance of the Korotkoff's sounds indicated the systolic blood pressure while disappearance of the Korotkoff's sounds indicated diastolic blood pressure.<sup>(17)</sup>

**Statistical analysis:**

All the cardiovascular parameters before and after yoga training were compared and analyzed using student's paired t test. Results were expressed as mean ± S.D.

**Observations & results:**

| Parameter                | Before yoga training<br>(n=40)<br>mean ± S.D. | After yoga training<br>(n=40)<br>mean ± S.D. | P value     |
|--------------------------|---|--|-------------|
| Pulse rate               | 79 ± 3.3                                      | 71.4 ± 3.48                                  | P < 0.0001* |
| Systolic blood pressure  | 79.2 ± 3.59                                   | 74.3 ± 3.75                                  | P < 0.0001* |
| Diastolic blood pressure | 117.6 ± 4.01                                  | 111.65 ± 2.52                                | P < 0.0001* |

\* P < 0.0001 is considered highly statistically significant.

Values of all the cardiovascular parameters like pulse rate, systolic blood pressure and diastolic blood pressure are significantly decreased after the yoga training.

**Discussion:**

Our study shows significant decrease in all cardiovascular parameters viz. pulse rate, systolic blood pressure and diastolic blood pressure after 8 weeks of yoga training.

Our results are in accordance with the following studies:

Jain S.<sup>(10)</sup> found significant decrease in blood pressure (systolic and diastolic) and heart rate in 40

pre-hypertensive subjects after 6 weeks of pranava yoga training. They stated that yoga increases the vagal activity.

Potey GG et al<sup>(11)</sup> found significant decrease in blood pressure, pulse rate and serum cortisol levels in 20 medical students after 3 months of regular practice of yoga when compared with controls.

They attributed this to increase in vagal tone. Jimenez AR et al<sup>(12)</sup> found improvement in cardiovascular fitness in females (yoginis) practicing 11 week program of Hathiyoga. Gujjala R et al.<sup>(13)</sup> studied meditators (50 subjects) who were practicing Raja- Yoga for more than 6 months

and non-meditators (50 subjects) who had never done any kind of meditation. Diastolic blood pressure was significantly less in meditators as compared to non-meditators. They contributed this to tilt in autonomic balance towards parasympathetic predominance.

Nene SB et al.<sup>(14)</sup> studied 50 volunteers who were doing regular yoga for 5 years. They found significant decrease in heart rate, blood pressure both systolic and diastolic in these subjects.

Chakraborty T et al<sup>(15)</sup> performed a case control study to find out the effects of simple yogic exercise programs (asanas and pranayamas) on selected cardiovascular function tests in thirty nine elderly individuals of both sexes, between 50 and 70 years of age. They found significant decrease in mean arterial pressure and resting heart rate after 6 weeks of training. They stated that regular activity of yoga restores the baroreceptor sensitivity towards the normal.

Bharshankar J et al<sup>(16)</sup> studied pulse rate, systolic and diastolic blood pressure in 50 control subjects (not doing any type of physical exercise) and 50 study subjects who had been practicing yoga for 5 years. They found significant reduction in pulse rate, systolic and diastolic blood pressure in study subjects.

Gupta V et al<sup>(18)</sup> studied the effect of 20 minutes of nadi-shodhana pranayama practice in 30 medical students of both sexes. They found significant decrease in heart rate, systolic and diastolic pressure in these students.

Singh A<sup>(19)</sup> performed a study to analyze the effect of yoga on cardiovascular and mental status in 50 normal adult persons above the age of 40 years. The heart circulatory status was assessed by recording the blood pressure and pulse rate, before and after 6 months of regular yogic practice. They found significant reduction in pulse rate,

systolic and diastolic blood pressure in these subjects.

Madanmohan et al<sup>(20)</sup> concluded that a comprehensive 8-week yoga therapy programme produces significant improvement cardiovascular parameters in patients of essential hypertension by decreasing heart and blood pressure indices.

Karak P et al<sup>(21)</sup> found in 1 year pilot study that Yoga training produces significant decrease in systolic blood pressure, mean arterial pressure, and heart rate. Surwase SP et al<sup>(22)</sup> studied 60 normal healthy females and males volunteers in the age group of 30 to 50 years. Cardiovascular efficiency was tested by using parameters like systolic blood pressure, diastolic blood pressure and heart rate. Pranayama training for 1 month resulted in significant decrease in systolic blood pressure and heart rate in the study group.

The results obtained in our study can be explained as follows:

Blood pressure is the lateral pressure exerted by the flowing blood on the walls of the blood vessel. Systolic blood pressure is maximum pressure recorded during systole while diastolic blood pressure is the lowest blood pressure during diastole. Blood vessels are maintained in a continuous contracted state by sympathetic tone. Systolic blood pressure is determined mainly by the cardiac output. Diastolic blood pressure is determined by total peripheral resistance, while pulse rate or heart rate is determined cardiac vagal tone.<sup>(17, 23)</sup>

As stress is responsible for sympathetic stimulation and rise in blood pressure, the beneficial effects of lowering of blood pressure obtained in our study may be due to stress reduction by yogic techniques particularly by meditation and pranayama.<sup>(23, 24)</sup> Practice of yoga affects the higher centers like hypothalamus and limbic system and alters the

autonomic discharge by decreasing sympathetic discharge and increasing parasympathetic outflow.<sup>(14, 25)</sup> Increase in vagal tone of the heart causes slowing of the heart rate and hence of the pulse rate seen in our study. Decrease in sympathetic discharge to the heart causes decrease in contractility of the heart, so cardiac output decreases. This accounts for the decrease in systolic blood pressure seen in our study. Decreased sympathetic discharge also causes decrease in sympathetic tone of the arterioles, so there is vasodilation and decrease in the peripheral resistance. This results in decrease in diastolic blood pressure seen in our study.<sup>(17, 26, 27)</sup> Regular yogic practices also lead to decrease in oxygen

consumption by the heart and work load on the heart.<sup>(28)</sup> This causes decrease in cardiac output. This also may account for decrease in systolic blood pressure seen in our study.

**Conclusion:**

Our study shows significant reduction in blood pressure (systolic and diastolic) and pulse rate after 8 weeks of yoga training. So adoption of regular practice of yoga as a part of life-style will certainly help to retard the development and progression of hypertension with the advancing age. Thus doing yoga on regular basis will help to prevent morbidity and mortality due to cardiovascular diseases.

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