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## The immediate effect of Sheethali and Sheethkari Pranayama on blood pressure and cardiovascular changes among hypertensive patients

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### ABSTRACT

The modern sedentary lifestyle is prone to produce various physiological and psychological stress resulting in hypertension and cardiovascular diseases causing high mortality rate in India. Sheethali and Sheethkari Pranayama are known to cool down and relax the body by improving the autonomic function and reducing the overactivity of sympathetic outflow. Therefore, an attempt has been made to determine the immediate effect of these pranayamas on hypertensive patients. The objective of the present study is to compare the blood pressure of hypertensive patients before the practice of the Sheethali & Sheethkari Pranayama immediately after practice. The study was conducted on 20 hypertensive patients on regular medical management who visits Saveetha hospital OPD (study group) and 20 healthy subjects of the same age group (control group). The recording of blood pressure was done before and after the practice of Sheethali and Sheethkari Pranayama for both the group. The results were statistically analyzed using students t-test. The pre-and post-intervention comparison showed significant ( $P < 0.05$ ) reduction in cardiovascular parameters such as BP, HR, PP, MAP, RPP and DoP after the immediate practice of Sheethali and Sheethkari Pranayama in both hypertensive patients and control group. The improvement in Hypertension group was significantly higher than the control group. The findings suggest that the immediate effect of Sheethali and Sheethkari Pranayama have reduced the SBP, DBP and HR on hypertensive patients by decreasing the sympathetic activity. These pranayamas can be included in regular management protocol of hypertensive patients.



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### INTRODUCTION

Today modern sedentary lifestyle is more prone to create various forms of psycho-somatic stress resulting in elevated blood pressure and heart rate. Hypertension is the most common adjustable risk factor for cardiovascular diseases causing death in India contributing to one-fourth of total mortality (Goyal R *et al.*, 2014). Prevalence of hypertension in Total Indian Population is 29.8% (Anchala R *et al.*, 2014) and recent researches provide evidence that excess functioning of sympathetic nervous system due to stress has a role in the pathogenesis of hypertension, so relaxation techniques such as Yoga is emerging to enhance the in quality of life

(Bhavanani AB, Sanjay Z 2012). Pranayama, a breath control technique is a masterpiece of Yoga which is a more potent form of practice compared to other techniques such as asana (posture), Mudra (Holding), and Relaxation techniques. It also helps us in being aware of one's breathing pattern which will help in controlling the internal energy and regulate the flow of Prana (energy). Though various types of pranayama have been practised in recent days, Nadisudhi, Savithri, Bhramari, Khapalati, Bhastrika, Sheethali and Sheethkari pranayama are the one most familiar among the practitioners. Previous studies have revealed that practice of Savitri pranayama and shavasan is an efficient tool for prevention and management of stress-induced lifestyle disorder such as Diabetes mellitus, Hypertension and obesity (Rai U.C *et al.*, 1982; Goyal R *et al.*, 2014). Pranayama such as Bhramari helped in controlling stress in a healthy individual have been reported earlier. (Telles S *et al.*, 2013) The immediate practice of alternate nostril yogic breathing has helped in improving the work efficiency of hypertensives while decreasing their systolic as well as diastolic blood pressure (Murugesan R *et al.*, 2000). Pranayama and yoga practice such as bhujangasana, arduhashalabhasana, Vajrayana, Vajrayana, yoga mudra has been reported to be more effective in lowering the blood pressure in hypertensive patients than beta-blockers, sympatholytics calcium channel blockers, and ACE inhibitors (Wolff M *et al.*, 2013). A randomized controlled trial in hypertensive patients has revealed that practice of kundalini yoga has reduced blood pressure and improved their quality of life. (Madanmohan *et al.*, 2005). Regular practice of pranayama has improved the myocardial oxygen demand by increasing the rate pressure product (RPP) which is an indicator of cardiovascular disease in hypertensive patients. Sheethali and Sheethkari pranayama commonly called as cooling pranayama as it is bringing a cooling effect while practising it (Thanalakshmi J *et al.*, 2014). Physiological effects of these pranayamas are not explored much, so the present study was planned to determine the immediate effects of this pranayama on blood pressure changes in hypertensive patients.

## MATERIALS AND METHODS

The research work was carried out in the department of physiology, Saveetha Medical College after obtaining ethical clearance from the Institutional Ethics Committee of Saveetha Medical College & Hospital (SMC/IEC/2017/203). Information sheet regarding the study with all relevant information was given to all the participants and written informed consent form was also obtained. Twenty essential hypertensive patients of age group 20-44

years of both the sex (11 male and 9 female) coming to OPD of Saveetha hospital were included as a study group by accidental sampling. They all were under regular standard medical management with antihypertensive drugs. The screening and identification of the essential hypertensive patients were done in collaboration with the General Medicine department, Saveetha Medical College & Hospital. Patients under medication with Systolic Blood Pressure > 120 mm Hg were excluded. Secondary Hypertension with Lab reports indicating complications was also excluded from the study. The patients who underwent any regular exercise, yoga or Pranayama practice were also excluded. (Madanmohan *et al.*, 2005)

Blood pressure and heart rate assessment were done in the morning between 9 am to 12 noon. An anthropometric measurement such as height was done using stadiometer and weight was measured using the digital weighing machine. Using a questionnaire, demographic details, medication for blood pressure details, disease history, alcohol consumption, cigarette smoking, drug intake, occupational history and sleep history was also collected. Heart rate was measured in the radial artery and blood pressure was recorded using calibrated digital blood pressure monitoring device. Three trials of recording were done with five minutes interval and the lowest reading was included. The pulse pressure (PP) was calculated by subtracting systolic with diastolic blood pressure. Mean arterial pressure (MAP) was calculated using the standard formula  $DP + 1/3 PP$ . The rate pressure product which indicates hemodynamics was calculated from heart rate  $\times SP/100$ . The double product an index of oxygen consumption was calculated as heart rate  $\times MAP/100$ .

Pre-interventional data was collected for both control group and study group in sitting posture and they were individually thought to perform Sheethali and Sheethkari Pranayama.

**Sheethali and Sheethkari Pranayama:** Qualified yoga trainer gave yoga instruction for the participants as per the standard procedure after giving a brief orientation on the Pranayama practice. Participants practised Sheethali Pranayama by sitting in padmasana position with an erect spine. They were asked to inhale through their tongue which was folded to form a tube with their eyes open. It was followed by deep exhalation through both the nostrils. It forms one round of Sheethali Pranayama and they were allowed to practice it for 10 minutes (9 rounds) which was followed by three minutes rest.

**Table 1: Demographic details of control and hypertensive group**

Demographic details	Control group	Hypertensive group
Age (Year)	38.56±7.28	40.80±11.66
Male/ Female	11/9	11/9
Height(cm)	164.80±18.49	169.18±19.40
Weight (Kg)	64.56±9.74	65.92±11.82
BMI (Kg/m <sup>2</sup> )	26.72±3.78	28.92±4.60

**Table 2: Comparison of Cardiovascular parameters in between Hypertensive and control group**

Cardiovascular changes	Control group		Hypertensive group	
	Before	After	Before	After
Systolic blood pressure (mmHg)	126.18±10.48	118.72±12.40*	142.10±11.90	129.82±14.72*
Diastolic blood pressure (mmHg)	74.50±10.19	66.52±8.98*	86.42±9.40	76.56±6.46*
Heart rate (bpm)	74.82±10.42	69.42±9.52	78.68±5.92	71.72±9.86
Pulse pressure (mmHg)	42.9±5.12	40.85±3.49	44.32±4.07	40.72±5.14*
Mean arterial pressure (mmHg)	89.3±13.4	86.33±12.4	94.23±12.2	87.3±11.7*
Rate pressure product (bpm-mmHg)	90.12±15.18	83.64±14.56*	96.72±18.11	82.32±16.09*
Double product (bpm-mmHg)	6886.3±543	6494.3±301*	6945.86±558	6313.6±448*

Control group subjects were also instructed to sit in a comfortable posture with erect spine and were allowed to normally breathe at a rate of 12-16/min. After the practice, post-intervention data such as blood pressure and heart rate were collected. The other parameters such as PP, MAP, RPP and DoP were calculated as mentioned earlier. The statistical analysis was done using SPSS version 17 and paired t-test was done to compare the pre-and post-interventional effect within the control and study group. Unpaired t-test was carried out to find the difference existing between the parameters of study and control group.

## RESULTS

The demographic details of both the control group and study group are depicted in table 1 and they are ideal for comparison as there was no significant difference existing in the variables. The cardiovascular parameters taken immediately after the practice of Sheethali and Sheethkari Pranayama are shown in Table 2. The practice of Pranayama has reduced the resting cardiovascular parameters in both control and hypertensive group. The Systolic blood pressure has significantly ( $P<0.05$ ) reduced from 142.10±11.90 to 129.82±14.72 in the hypertensive group. It has also reduced significantly ( $P<0.05$ ) in the control group from 126.18±10.48 to 118.72±12.40. The Diastolic blood pressure is reduced in the hypertensive group from 86.42±9.40 to 76.56±6.46 ( $P<0.05$ ) and it has also shown a significant reduction in the control group from 74.50±10.19 to

66.52±8.98( $P<0.05$ ). In the hypertensive group, Pulse pressure is reduced from 44.32±4.07 to 40.72±5.14, Mean arterial pressure is reduced from 94.23±12.2 to 87.3±11.7, Rate pressure product reduced from and 96.72±18.11 to 83.64±14.56 and Double product reduced from 6945.86±558 to 6313.6±448( $P<0.05$ ). Though there was a decrease in Heart rate from 78.68±5.92 to 71.72±9.86, it was not statistically significant.

## DISCUSSION

In this study, the practice of Sheethali and Sheethkari Pranayama for 20 minutes has significantly reduced cardiovascular parameters in hypertensive patients as well as normal healthy volunteers. A similar result was found earlier by practising other types of pranayama such as Chandra Nadi Pranayama and sukhapranayama. (Bhavanani AB 2012) The cardiovascular effects were more pronounced about the MAP, RPP, and Do P. RPP and DoP are particularly important because they are indicators of myocardial oxygen utilization and load on the heart. (Udupa K *et al.*, 2004) The decrease observed following Sheethali and sheethkari pranayama implies a lowering of strain on the heart itself. The observed changes may in part be due to an increase in parasympathetic activity and a decrease in sympathetic activity, which has been before reported in various studies of pranayama's practice. (Ravindra P N *et al.*, 2003) The favourable cardiovascular effects seen in this study may also be due to the rate of breathing. Previous studies have shown the beneficial effects of slow and deep breathing at the rate of 6 breaths/ min on decreasing rate of contraction and interbeat variability and this was probably due to the augmented vagal modulation of sinoatrial (SA) (Ravindra P N

*et al.*, 2006). The enhance in vagal modulation may be accountable for the decrease in heart rate and blood pressure seen in this study. It has been formerly recommended that slow and deep (6 breaths/min) breathing has the result of entraining all RR interval fluctuations, thus causing them to combine at the rate of respiration and to enhance significantly in amplitude. This will enhances baroreflex competence and may have contributed in the direction of lowering blood pressure. (Bernardi L *et al.*, 2001). This finding has potential therapeutic applications in routine clinical situations where blood pressure wants to be brought down rapidly. This pranayama is very simple, cost-effective, and may be supplementary to the management protocol for hypertensive patients in addition to the regular treatment. Further studies are necessary to facilitate a deeper perceptive of the mechanisms involved. We plan to find the persistence of this acute effects and long-term practice of these pranayamas in large scale to validate the findings.

## CONCLUSION

The results and findings of the study suggest that Sheethali and Sheethkari Pranayama practice has improved the cardiovascular changes in hypertensive patients and can be practised to bring down immediately the blood pressure in the day to day life.

**Conflict of Interest:** None declared

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