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# To Find Out Immediate Effect of Bhramari Pranayama on Blood Pressure, Heart Rate and Oxygen Saturation in Hypertensive Patients

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## ABSTRACT

**Background:** A lot of studies have shown the immediate effect of Bhramari pranayama on cardiovascular parameters in healthy individuals but to the best of our knowledge none have been done on the hypertensive patients

**Aim:** This study aimed to determine the immediate effects of Bhramari pranayama on hypertensive patients in terms of Systolic and Diastolic Blood pressure, Heart rate and oxygen saturation (SpO<sub>2</sub>)

**Methods:** Total of 40 participants meeting the inclusion criteria were included in the study. The participants were randomly divided into two groups experimental (Bhramari pranayama) and the control group of 20 each. The experimental group performed the Bhramari pranayama for 5 minutes. The control group did not receive any treatment. Pre and immediate post-intervention scores were measured in terms of systolic BP, Diastolic BP, heart rate and SpO<sub>2</sub>.

**Result:** On comparing the pre and post-intervention values of the outcome measures, it was observed that there was a statistically significant difference in Systolic BP values in Bhramari pranayama group. No significant difference was seen in Pre and Post values of Systolic and Diastolic BP, Heart rate and SpO<sub>2</sub> values in Control group. On comparing between the groups, it was observed that there was no statistically significant difference between the two groups in terms of systolic BP, Diastolic BP, heart rate and SpO<sub>2</sub>

**Conclusion:** Based on the present study, it can be concluded that the Bhramari pranayama has an immediate positive effect on reducing the Systolic Blood pressure acting through parasympathetic dominance. It can be practised in daily routine to reduce the stress originated cardiovascular risk in future.

**Key Words:** Hypertension, Immediate effect, Bhramari pranayama

## INTRODUCTION

Systemic hypertension is one of the major risk factors of cardiovascular mortality and morbidity around the world and one of the commonest non-communicable diseases in our country. Approximately 18 million deaths per year are caused by various cardiovascular diseases (CVD). Despite the remarkable progress in disease management, 30% of the deaths globally are due to CVD.<sup>1</sup> The world is facing a quantum leap in the number of hypertensive patients. At present, the overall prevalence of hypertension is believed to be 30-45%. In 2015, approximately 1.13 billion people worldwide were hypertensive and the number is expected to reach 1.5 billion till 2025.<sup>2</sup> According to the recent estimates, the over-

all prevalence of hypertension in Indian population is 29.8% with a higher prevalence found in urban areas<sup>3</sup>.

Hypertension is a chronic, persistent and mostly asymptomatic condition. According to the 2020 international guidelines, Hypertension or elevated blood pressure is diagnosed as systolic blood pressure (SBP) in the office or clinic of  $\geq 140$  mm Hg and/or diastolic blood pressure (DBP) of  $\geq 90$  mm Hg. It is further classified as Grade 1 Hypertension if SBP is 140–159 mmHg and/or DBP is 90–99 mmHg and Grade 2 Hypertension if SBP is  $\geq 160$  mmHg and/or DBP is  $\geq 100$  mmHg.<sup>4</sup>

Hypertension is a major modifiable risk factor for cardiac, cerebrovascular, and renal diseases in India. Early diagnosis

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and proper treatment of which would reduce a preventable burden of systemic complications related to hypertension such as congestive heart failure, coronary artery disease, ischemic and haemorrhagic stroke and chronic kidney disease. Thus, appropriate management of hypertension is imperative to prevent the complications and to ameliorate the quality of life of the patient. Out of the pharmacological and non-pharmacological interventions for controlling the blood pressure, the non-pharmacological measures can be undertaken alone before initiating the pharmacological therapy or in combination after.<sup>5</sup>

The non-pharmacological interventions include various measures like Weight reduction, Physical activity, Dietary modification, Tobacco and Alcohol consumption restriction, Yoga & Meditation.<sup>3,6</sup> Main aim of yoga is to enable the individual to attain and maintain the “sukhasthanam” that is a dynamic sense of physical, mental and spiritual well being. This is achieved by various approaches like Cultivation of right attitudes, Healthy and heart-friendly diet, Breath-body movement coordination practices, Yoga-asanas, Pranayamas, Shat kriyas, Mudras, Yogic relaxation, Dharana and Dhyana and Yogic counselling.<sup>7</sup>

Pranayama is the science of controlled, conscious expansion of Prana - the life force. It is known as the fourth limb of Classical AshtangaYoga.<sup>8</sup> There are wide-ranging benefits of pranayama to the human body. The eight major disciplines of Pranayama that facilitate the regulation and control of breath are Nadi Sodhana, Shitali Pranayama, Ujjayi Pranayama, Kapalabhati Pranayama, Bhastrika Pranayama, Bhramari Pranayama, Anuloma & Viloma Pranayama, Sheetkari Pranayama.<sup>9</sup> Bhramari is derived from the Sanskrit word ‘Bhramar’ meaning Wasp. The name Bhramari pranayama has come from the humming sound impersonating the flying wasp.<sup>10</sup> The art and science of Pranayama have enormous therapeutic potential in various disorders such as asthma, diabetes and hypertension. It can be used as a single therapy or together with Asanas and other aspects of Yoga.<sup>8</sup> Further, it is known that yoga and pranayama help manage the cardiopulmonary diseases, autonomic nervous system imbalances and psychosomatic disorders.<sup>11</sup> Studies have shown that Pranayamas such as Savitri, Kapalabhati, Bhasrika, Nadisuddhi, Bhramari cause pronounced physiological responses among normal healthy people. Various studies have been conducted to assess the effect of Bhramari pranayama on cardiovascular parameters. But very few studies have explored the immediate effect of Bhramari pranayama on haemodynamic parameters in hypertensive individuals. Hence this study was undertaken to assess the immediate effect of Bhramari pranayama on blood pressure, heart rate and oxygen saturation in hypertensive individuals

## METHODOLOGY

The study was carried out at the Datta Meghe College of Physiotherapy, Wanadongri Nagpur. Ethical approval was obtained from the Institutional Ethical Committee and informed consent was obtained from the participants. 40 hypertensive patients residing in the Nagpur region and outskirts, of both gender (22 females & 18 males) were recruited in the study. The study was carried out for a month.

Participants with age more than 40 years of both the gender, clinically diagnosed with hypertension<sup>12</sup>, on medication for hypertension and those willing to participate were included in the study. Participants with any systemic or metabolic diseases, chronic smokers and alcoholics were excluded from the study. The outcome measures used were blood pressure, heart rate and SpO<sub>2</sub>

They were randomly distributed in 2 groups, Experimental (n=20) and control group (n=20). The experimental group performed Bhramari Pranayama for 5 mins whereas the control group received no treatment. All the participants were asked to rest for 5 minutes before measuring the parameters. Resting Blood pressure, Heart rate and SpO<sub>2</sub> were measured with digital BP apparatus and pulse oximeter. Immediate post-intervention parameters were measured after performing Bhramari Pranayama

### Bhramari Pranayama

Participants were made to relax and sit in a comfortable atmosphere on a soft mat on the floor. The breathing technique was demonstrated to the patients as follows. Firstly one has to sit in a comfortable relaxed position (Sukhasana) while maintaining an erect posture. Eyes should be closed and one should maintain steady posture while practising Bhramari Pranayama. The participants were asked to slowly breathe in through both the nostrils up to a maximum of 5sec and exhale out completely again through both the nostrils for about 15sec. Thumbs were placed on the external auditory meatus, index and ring finger on the closed eyes and ring finger near the nostrils. While exhaling they were asked to chant the word “AUM” with a simultaneous nasal humming sound impersonating the sound of humming wasp. This leads to vibration of the inner nostril and laryngeal walls. With the completion of these steps, one completes a cycle of Bhramari pranayama (RR 3/min).<sup>13,14</sup> After 5 minutes of practising Bhramari pranayama, the outcome measures were reassessed.

## RESULTS

MYSTAT 12 software was used to calculate the results in this study. Systolic and diastolic blood pressure, heart rate and oxygen saturation were the outcome measures used. Descriptive statistics such as mean and standard deviations

were calculated to describe all the variables. The paired t-test and the unpaired t-test were used to verify differences between pre- and post-intervention. The statistical analysis was conducted at 95% confidence level, and  $p < 0.05$  was considered statistically significant.

The gender ratio was 12:8 (12 females and 8 males) in Bhramari group and 10:10 (10 females and 10 males) in the Control group. The difference in the mean age of both the groups was statistically not significant (Table 1)

**Table 1: Baseline demographic data of both the groups**

Group	Bhramari group	Control group	t value	p-value	Inference
Age (years)	59.71 ± 8.95	58.57 ± 7.87	2.17	0.80	Not significant
Gender ratio (M:F)	12:8	10:10			

Comparison of the pre and post-intervention values (student's paired t-test) of the outcome measures showed that there was a statistically significant difference only in the Systolic BP values in Bhramari group. No significant difference was seen in Pre and Post values of Systolic and

Diastolic BP, Heart rate and SpO2 values in Control group. Intergroup comparison (student's unpaired t-test) showed that there was no statistically significant difference between the two groups in terms of Systolic and Diastolic BP and Heart rate and SpO2 (Table 2)

**Table 2: Mean and SD scores of Bhramari and Control groups, Pre-intervention and Post-intervention**

	Bhramari Group				Control Group				Between groups	
	Pre inter- vention Mean ± SD	Post inter- vention Mean ± SD	Paired t test		Pre inter- vention Mean ± SD	Post interven- tion Mean ± SD	Paired t test		p value	Inference
			Mean Differ- ence	p value			Mean Differ- ence	p value		
Systolic BP	127.71 ± 8.40	118.85 ± 9.83	8.85	0.004	127.57 ± 9.09	127.28 ± 8.82	0.28	0.17	0.11	Not Significant
Diastolic BP	78.42 ± 6.52	80.71 ± 5.99	2.28	0.23	78.42 ± 6.52	78.57 ± 6.39	0.14	0.35	0.53	Not Significant
Heart rate	72.14 ± 11.03	72 ± 10.52	0.14	0.89	72.14 ± 11.03	71.85 ± 11.21	0.28	0.17	0.98	Not Significant
SpO2	96.85 ± 2.47	97.28 ± 1.70	0.42	0.51	96.85 ± 2.47	96.71 ± 2.28	0.14	0.60	0.60	Not Significant

## DISCUSSION

The main aim of the study was to determine the immediate effect of Bhramari Pranayama on blood pressure, heart rate and oxygen saturation in patients with hypertension. We found that there was a statistically significant reduction in systolic blood pressure immediately after one session of Bhramari Pranayama performed for 5 minutes.

A study conducted by Rashma S et al on 30 healthy adolescents showed a significant reduction in SBP immediately after performing Bhramari pranayama. They concluded that a single session consisting of 5 cycles of Bhramari pranayama had significant effects on resting cardiovascular parameters in the healthy adolescents<sup>10</sup>. In another study conducted by Vungarala Satyanande et al on 30 healthy individuals showed a significant reduction in blood pressure after performing Anuloma-Viloma and Bhramari pranayama technique. They stated that the increase in parasympathetic dominance re-

sulted in a reduction in basal heart rate. Also, fall in systolic as well as diastolic blood pressure was due to a reduction in sympathetic impulse following the practice of performing Anuloma-Viloma and Bhramari pranayama.

Dr Jyoti A Upadhye in her research paper on Health benefits of Bhramari Pranayama stated the effect on Bhramari pranayama on hypertension, sleep apnea, and headaches. According to her work, a regular practice of Bhramari pranayama had shown to keep the blood pressure in check and cure chronic headache and migraine problems. She stated that the nasal exhalation during Bhramari pranayama facilitates the production and release of nitric oxide which helps to dilate arteries, improve blood circulation and maintain the supply of oxygen to the heart.<sup>16</sup> L Nivethitha et al in their review article on the effect of various pranayama (breathing techniques) on cardiovascular and autonomic variables stated that five minutes of slow paced Bhramari pranayama reported to influence parasympathetic dominance on the car-

diovascular system which was responsible in reducing SBP, DBP, mean arterial BP and HR.<sup>17</sup>

The findings of our study were also supported by another study done by T Pramanik et al, who in their study on 50 healthy individuals concluded that slow Bhramari pranayama breathing (respiratory rate 3/min) for 5 minutes caused a fall in the systolic blood pressure. They stated that slow pace pranayama influences the heart rate and blood pressure through parasympathetic dominance. As Bhramari pranayama is a type of slow pace breathing exercise, it stimulates the parasympathetic system. More they described that while exhaling, vibration effect on the nasal /laryngeal mucous membrane together with the humming of “AUMmm” lead to reflex apnoea by turning off inspiratory centre. It causes bradycardia through chemoreceptor Sinu-aortic mechanism.<sup>14</sup> Also in a study by Kuppusamy et al on 60 healthy adolescents, they concluded that The HR, BP indices, Pulse Pressure (PP), Mean Arterial Pressure (MAP), Rate Pressure Product (RPP) and Double Product (DoP) were found to be significantly decreased after Bhramari Pranayama practice compared with control. A single session of 5 cycles of Bhramari Pranayama practice, has significant effects on resting cardiovascular parameters in healthy adolescents. They stated that increase in parasympathetic activity and decrease in sympathetic response in the Bhramari Pranayama group was responsible for causing a decrease in Heart Rate (HR), Diastolic blood pressure (DBP) and Mean Arterial Pressure (MAP).<sup>11</sup> In yet another study, it was found that BP and HR decreased significantly when measured immediately after the practice of Savitri Pranayama which is similar to Bhramari Pranayama which supports our results as well.<sup>18</sup>

Further, the neural respiratory elements may be responsible for a mechanism that clarifies how slow deep breathing modifies the autonomic nervous system. During extended voluntary expiration, there is a raise of intrathoracic pressure causing more blood flow to the heart from lung and thus increasing the stroke volume. This in turn increases the blood pressure stimulating the baroreceptors in the carotid sinus. Further, this increased baroreceptor discharge inhibits the vasoconstrictor nerves and excites the vagus innervations of the heart. These may be the possible reasons for the reduction in blood pressure in the present study. Another study by Jerath et al. and Jyoti et. al. explained that there is decreased oxygen consumption, heart rate and blood pressure resulting from slow deep breathing in pranayama, thus adding more strength to our study<sup>19, 20</sup>

### Limitation

As the study was to see the immediate effects of the treatment the long term effectiveness was not considered for statistical analysis. Also, it was not seen for how much time the immediate effect was present. Thus it can be suggested to perform further studies in this context.

## CONCLUSION

Based on the present study, it can be concluded that the Bhramari pranayama has an immediate positive effect on reducing the Systolic Blood pressure acting through parasympathetic dominance. It can be practised in daily routine to reduce the stress originated cardiovascular risk in future.

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