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## Effect of Bhramari versus Sheetal pranayama on quality of life in hypertensive patients

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### Abstract

**Introduction:** Studies on hypertension (HTN) have examined the impact of pranayama breathing techniques on nitric oxide (NO), serum cortisol, and quality of life (QOL) in older patients with hypertension. This trial compared Sheetal and Bhramari pranayama effects on serum cortisol, NO, the 30-second sit-to-stand test, diastolic and systolic blood pressures, and the life quality as assessed by the short form 12 survey in hypertensive elderly (aged  $\geq 60$  years old). The aim of this survey was to determine which form of Bhramari or Sheetal is more efficient in improving the QOL in hypertensive patients.

**Material and methods:** At Cairo University's Faculty of Physical Therapy, sixty senior individuals were chosen, and were randomly distributed between the Sheetal category (30 patients) or the Bhramari category (30 patients). The daily 20-minute pranayama interventions lasted for a period of 12 weeks. Outcome measures: serum cortisol, serum NO, systolic blood pressure (SBP), diastolic blood pressure (DBP), 30-second sit-to-stand test, and the SF12 QOL questionnaire were analyzed.

**Results:** The post-comparison between groups showed considerable improvements in serum cortisol  $\downarrow 14.62\%$ , serum NO  $\uparrow 45.12\%$ , SBP  $\downarrow 13.43\%$ , and DPB  $\downarrow 7.69\%$  in favor of the Sheetal group, with significant improvement in mental health  $\uparrow 21.04\%$  in the Bhramari group, and nearly the same changes in both groups in (30-second sit-to-stand test, SF12 QOL questionnaire (physical)).

**Conclusions:** Sheetal pranayama appears more effective for lowering SBP, DBP, serum cortisol, and increasing (NO) in hypertensive elderly but Bhramari pranayama appears more effective for increasing mental health (Sf12 QOL) in hypertensive elderly. Hence, Sheetal pranayama can be used as an adjuvant therapy to enhance physical fitness and health quality.

**Keywords:** quality of life, hypertension, pranayama, elderly

### Introduction

Hypertension (HTN) is a major community medical issue that affects simultaneously developed as well as emerging economies and nations, with its strong

correlation with mortality and morbidity rates for cardiovascular and renal disorders. Every year, hypertension contributes to 10.4 million fatalities globally [1]. With almost 46% of individuals afflicted, Africa has the greatest age-specific rates of hypertension,



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according to the World Health Organization [2]. Chronic psychosocial stress (CPS) might increase the risk of hypertension by causing a continuous rise in glucocorticoid (cortisol) levels [3]. This leads to decreased potential of the defense mechanism to react to diminish inflammatory activities of cortisol, repression of the cortisol resistance, and glucocorticoid receptor, the build-up of visceral fat, mild chronic inflammation, increased retention of salt, and insulin resistance. Elderly hypertension patients showed mean cortisol levels higher than those found in aged healthy individuals. The average level of cortisol increases as blood pressure rises [4]. Nitric oxide (NO) is a relaxant agent generated from the endothelium. An accelerated manifestation of the changes that occur with aging manifests themselves as the vascular alterations related to hypertension, such as endothelial dysfunction. All significant cardiovascular risk factors are linked to the endothelium's insufficient production of NO [5].

The quality of life (QOL) of hypertensive elderly persons is poorer than that of healthy people, and a decline in QOL has been linked to the disease's symptoms. QOL is a crucial indicator of overall wellness. In addition to increasing the risk of dependency and low physical fitness, hypertension can cause several pathophysiological and psychological changes, such as sadness and increased social isolation, which interfere with daily activities for older persons [6].

The Bhramari Pranayama is one of these traditional yogic breathing exercises that, in addition to utilizing a distinctive breathing method, also involves the creation of a continuous humming noise throughout the breathing-out period, which induces a state of calm in the body [7]. Pranayamas are thought of as a sort of meditation in themselves, in addition to being a prelude to profound spirituality. They result in improved physical health, self-awareness, enhanced cognitive and pulmonary function, lower anxiety, raised blood pressure, and other psychological health issues in older persons, most likely through raising the parasympathetic tone and improving NO bioavailability. Pranayamas have been shown to generate a variety of positive health impacts, such as stress reduction, increased respiratory function, cardiovascular benefits, and improved cognitive performance [8]. The advantages of practicing Sheetal Pranayama are that it effectively lowers blood pressure, aids blood purification, helps to lower body temperature, and helps to combat sleeplessness. It is said to be effective in reducing stress by calming the mind. It also helps control anxiety. Finally, blood pressure is significantly lowered with Sheetal pranayama [9].

As no studies have compared the effects of Bhramari and Sheetal pranayama on life quality, cortisol, nitric oxide, and physical fitness in senior hypertensive clients, this survey aimed to determine which form of Bhramari or Sheetal is more efficient in improving quality of life in hypertensive patients.

## Materials and methods

### Ethics

The participants in this clinical investigation gave their consent, and the authors obtained regional ethics approval. Both consent and the protocol approval number issued by the university was (P.T.REC/012/003823). The trial protocol (NCT05651854) was registered in detail on "www.clinicaltrials.gov."

### Participants

From 1st September 2022 to 28th February 2023, sixty non-obese elderly adults were recruited to Sheetal or Bhramari groups,  $n = 30$  for each group. The outpatient clinic served as a place to recruit patients of both genders, aged 60 to 75. The patient inclusion criteria were: hypertension (140–159 mmHg for systolic blood pressure (SBP) and/or 90–99 mmHg for diastolic blood pressure (DBP)) and hemodynamic stability. The patients in both groups received Beta-Blocker medication (5mg) once daily, prescribed by a physician. The patient exclusion criteria were: cardiac issues (such as atrial fibrillation, recent myocardial infarction, heart failure, left bundle-branch block), patients with hepatic, renal, or neurological disorders, patients who had trouble rolling their tongues for Sheetal training as in tongue edema in acromegaly, cerebrovascular disease or Bell's palsy, myxedema, amyloidosis, and tongue carcinoma, diabetic neuropathy-related tongue discomfort, mouth sores, oral cancer, mouth burns, patients who were heavy drinkers and smokers, and who had acute ear infections that impair Bhramari breathing.

### Procedures

#### *Sheetal pranayama*

The patient sat comfortably with their eyes closed, and their hands on their knees during the exercise. The patient then began to roll up the sides of the tongue to form a tube after expanding it outward to a comfortable extent. After closing their mouth after each inhalation and exhaling through their nose, the patient inhaled deeply and slowly through the tube-shaped tongue. The same activity was done by participants for 10 minutes every morning and 10 minutes at night for a period of 12 weeks [10].

### *Bhramari Pranayama*

Participants were instructed to rest and maintain an upright posture while sitting in a relaxed, comfortable position, thus maintaining a stable position while performing Bhramari Pranayama with closed eyes. The participants were instructed to inhale gently through both nostrils for five seconds before exhaling fully through both nostrils once again for around fifteen seconds. They put their thumbs on the external auditory meatus, closed eyelids with the index and ring fingers, and the nose with the ring finger. They were instructed to repeat the phrase “AUM” while simultaneously making a nasal humming noise. The laryngeal and inner nostril walls vibrated. After these actions were completed, a Bhramari pranayama round was finished. (RR 3/min) (10 minutes in the morning and 10 minutes at night) [11].

### **Outcome measures**

The primary outcome was related to the serum cortisol level. Venous blood samples were drawn from the antecubital vein of subjects at 8:00 am for all subjects one day before the study began and after three months of pranayama exercises. To measure the morning blood cortisol level, ELISA assay kits were utilized.

The secondary outcomes were serum nitric oxide, blood pressure readings for the systolic and diastolic pressures were taken using a digital sphygmomanometer (Granzia device, made in Italy), the 30-second sit-to-stand test, and short form 12 life quality questionnaire.

### **Statistical analysis**

With the help of SPSS, version 25, the data were examined in every category, and the two pranayama categories were compared using paired and independent-samples-tests. The Shapiro-Wilk test was performed once and showed the normality of the data dispersion. A p-value of less than 0.05 was used to identify the statistical significance threshold.

### **Results**

Baseline characteristic of the groups is presented in table 1. The flow of the participants is presented in figure 1.

The post-comparison between groups revealed significant differences in serum cortisol, serum NO, SBP, and DPB in favor of the Sheetal group, as well as a significant improvement in the mental component in favor of the Bhramari group, and nearly the same changes in both groups (30-sec sit-to-stand test, physical component) (Tab. 2).

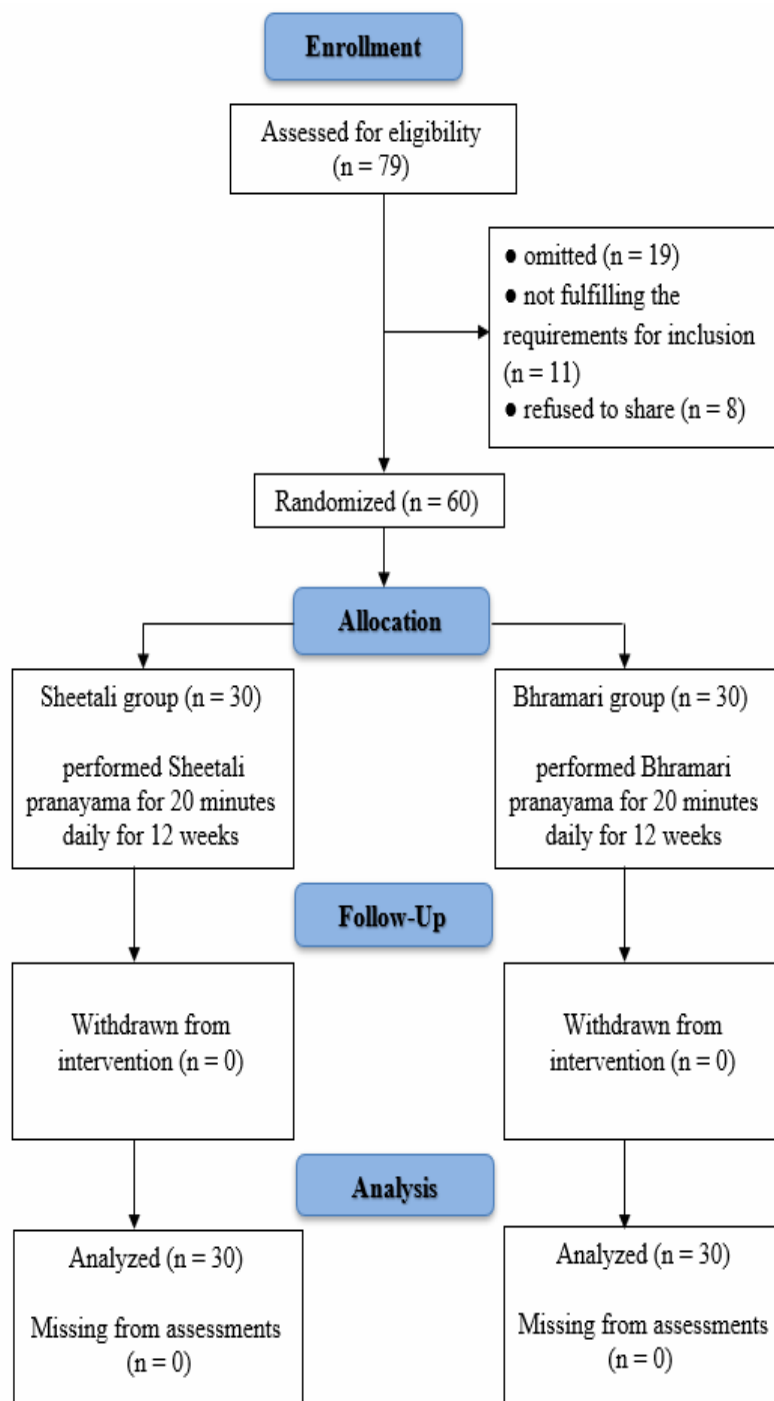
### **Discussion**

The objective of this trial was to compare Sheetal and Bhramari pranayama's effects on serum cortisol, NO, the 30-second sit-to-stand test, diastolic and systolic blood pressures, and the life quality in hypertensive elderly subjects. This comparative trial's results demonstrate significant differences between both groups in serum Cortisol, serum NO, SBP, and DBP. Sheetal pranayama appears to be more effective for lowering SBP ↓ 13.43%, DBP ↓ 7.69%, serum cortisol ↓ 14.62% and increasing (NO) ↑ 45.12% in hypertensive elderly persons, but Bhramari pranayama appears more effective for improving mental health (Sf12 QOL) ↑ 21.04% in hypertensive elderly individuals.

The results can be attributed to the cooling effects of Sheetal pranayama. This altered sympathovagal tone contributes to a relaxed feeling, improving cerebral blood flow, uptake of oxygen, and total parasympathetic stimulation. Reduced stress levels as a result of practicing Sheetal pranayama have been shown to help people feel more relaxed mentally [12]. One of the most popular kinds of cooling pranayama, Sheetal, involves using the tongue to inhale and the nose to exhale. Practicing Sheetal pranayama lowers people's stress levels, which results in mental calm [13].

In Bhramari pranayama, the vibration of the nasal as well as laryngeal mucous membranes during exhalation, in addition to the buzzing of “O-UMmma,” caused reflex apnea by turning off the inspiratory center, which results in bradycardia through the chemoreceptor sino-aortic mechanism. Additionally, during prolonged intentional expiration, there is an elevation in intra-thoracic pressure, which causes further bloodstream from the lung to the heart. This in turn raises blood pressure that activates the carotid sinus's baroreceptors. Moreover, this elevated baroreceptor discharge blocks vasoconstrictor nerves, while activating the heart's vagus innervations. These could be the causes of a decrease in blood pressure and heart rate [14].

Two primary paths seem to be involved in how yoga is useful. Firstly, by reducing the impacts of stress and fostering a variety of beneficial downstream impacts on metabolic performance, neuroendocrine state, and related systemic inflammatory responses. Secondly, yoga may boost parasympathetic function by activating the vagus nerve directly, and result in favorable modifications to the neuroendocrine, metabolic, inflammatory, and related cardiovagal function, emotion, and activity levels [15]. The limbic system receives signals from mindful activities (body relaxation and breathing techniques). One of the internal brain axes is the hypothalamic-pituitary-adrenal axis that this system suppresses. Hormones related to stress are produced by



**Fig. 1.** Consort infographic of the hypertension study

**Tab. 1.** The basic metrics between the 2 pranayama classes

	Sheetali class	Bhrumari class	P-value
Age (years)	65.23 ± 3.97	66.46 ± 4.07	0.24
BMI (kg/m <sup>2</sup> )	27.03 ± 0.99	27 ± 0.94	0.89
Sex (male: female)	14:16	12:18	

BMI – body mass index, P-value < 0.05.

**Tab. 2.** Results after 12 weeks, mean  $\pm$  SD in and across groups

Parameters	Sheetali group	Bhramari group	P-value (among categories)
Serum cortisol ( $\mu\text{g/dl}$ )	Average $\pm$ SD	Average $\pm$ SD	
Pre-treatment	13.95 $\pm$ 2.55	14.27 $\pm$ 1.95	
Post-treatment	11.91 $\pm$ 2.5	13.26 $\pm$ 2.56	0.044*
Significance measure (in groups)	<0.001*	0.007*	
Percentage of improvement %	$\downarrow$ 14.62%	$\downarrow$ 7.07%	
Serum nitric oxide ( $\mu\text{mol/L}$ )	Average $\pm$ SD	Average $\pm$ SD	
Pre-treatment	4.5 $\pm$ 0.96	4.29 $\pm$ 1.07	
Post-treatment	8.2 $\pm$ 0.89	5.56 $\pm$ 1	<0.001*
Significance measure (in groups)	<0.001*	<0.001*	
Percentage of improvement %	$\uparrow$ 45.12%	$\uparrow$ 22.84%	
Blood pressure through systole (mmHg)	Average $\pm$ SD	Average $\pm$ SD	
Pre-treatment	147.2 $\pm$ 4.65	146.4 $\pm$ 4.42	
Post-treatment	127.43 $\pm$ 3.14	130.7 $\pm$ 5.75	<0.001*
Significance measure (in groups)	<0.001*	<0.001*	
Percentage of improvement %	$\downarrow$ 13.43%	$\downarrow$ 10.72%	
Blood pressure through diastole (mmHg)	Average $\pm$ SD	Average $\pm$ SD	
Pre-treatment	94.1 $\pm$ 2.78	94.43 $\pm$ 2.86	
Post-treatment	86.86 $\pm$ 2.34	90.9 $\pm$ 2.7	<0.001*
Significance measure (in groups)	<0.001*	<0.001*	
Percentage of improvement %	$\downarrow$ 7.69%	$\downarrow$ 3.73%	
30 sec. sit-to-stand test	Average $\pm$ SD	Average $\pm$ SD	
Pre-treatment	6.1 $\pm$ 1.49	6.33 $\pm$ 1.8	
Post-treatment	8.3 $\pm$ 1.56	8.16 $\pm$ 1.55	0.680
Significance measure (in groups)	<0.001*	<0.001*	
Percentage of improvement %	$\uparrow$ 26.5%	$\uparrow$ 22.42%	
SF12 questionnaire (physical)	Average $\pm$ SD	Average $\pm$ SD	
Pre-treatment	33.64 $\pm$ 3.43	34.09 $\pm$ 2.85	
Post-treatment	35.22 $\pm$ 3.41	35.69 $\pm$ 3.02	0.579
Significance measure (in groups)	<0.001*	<0.001*	
Percentage of improvement %	$\uparrow$ 4.48%	$\uparrow$ 4.48%	
SF 12 questionnaire (mental)	Average $\pm$ SD	Average $\pm$ SD	
Pre-treatment	32.67 $\pm$ 3.23	33.09 $\pm$ 4.64	
Post-treatment	36.31 $\pm$ 5	41.91 $\pm$ 4.88	<0.001*
Significance measure (in groups)	<0.001*	<0.001*	
Percentage of improvement %	$\uparrow$ 10.02%	$\uparrow$ 21.04%	

P-value < 0.05 SD – standard deviation, SF12 – Short form 12 quality of life questionnaire.

this axis. As a result, the synthesis of stress hormones such as cortisol declines [16,17]. According to a previous study, practicing yoga regularly lowers baseline cortisol, catecholamine, and sympathetic activity, and boosts parasympathetic activity, all of which have positive effects on cognitive abilities and cerebral neurophysiology [13].

As previously mentioned, women who identified as “emotionally upset” received treatment in the form of three months of weekly yoga courses lasting 90 minutes. Women in the yoga group showed improvements in emotional exhaustion, sadness, anxiety, energy, weariness, and overall well-being after three months. Overall well-being ratings improved by 65%, anxiety levels by 30%, and depression scores by 50% [18]. In line with our study, after three months of pranayama training, the seniors’ (retired people in their 60s to 70s) anxiety levels dropped [19].

Recent research confirmed our findings, finding that practicing Sheetal pranayama for 4 weeks caused a decrease in blood pressure through systole and diastole that could be attributed to the autonomic component being modulated with parasympathetic and somewhat lowered tone of sympathetic primacy, which reduces arterial stiffness and increases nitric oxide bioavailability [9]. Consistent with our findings, the resting cardiovascular parameters of healthy teenagers are significantly affected by one session of five cycles of Bhramari Pranayama. They claimed that in the team that practiced Bhramari pranayama, a rise in parasympathetic activity and a fall in sympathetic response accounted for the declines in Heart Rate (HR), average pressure in arteries, and blood pressure during diastole [20]. Studies have concluded that practicing Bhramari pranayama (Bhr. P) regularly lowers the heart’s sensitivity to stress by promoting dominantly parasympathetic and Cerebro-hypothalamic-medullary suppression. There is a decrease in the number of heartbeats, blood pressure, and cognitive development in healthy people participants immediately after practicing Bhr. P. [7]. As support to our results, the cardiovascular system was believed to be affected by five minutes of slow-paced Bhramari pranayama, which led to parasympathetic dominance and decreased SBP, DBP, and mean arterial BP [21].

Another study found that 5-minute pranayama coupled with the extended detectable vibrational resonating of the sound “MMMM” while exhaling significantly reduced SBP and PR in 29 hypertension patients [22]. On the contrary, a single bee-humming breathing session in hypertension individuals that weren’t frequent yoga practitioners did not result in any appreciable drop in blood pressure throughout or just after completing the pranayama [23]. According to Upadhye [24] regular Bhramari pranayama practice has been demonstrated to

lower the blood pressure and also treat migraine and chronic headache issues. Doing Bhramari pranayama while exhaling through the nose encourages the creation and release of nitric oxide, which widens the arteries and promotes the flow of blood, and maintains the heart’s oxygen supply [24]. Moreover, humming boosts nitric oxide synthesis. According to estimates, humming boosts the quantity of innate nitric oxide production by 15 times when compared with calm exhalation [25].

Also in agreement with our findings was a recent study on 40 healthcare professionals from two hospitals in Rome, which found a substantial drop in stress and anxiety ratings, as well as an improvement in life-quality ratings following 4-week yoga and mindfulness training [26]. In parallel with our research, another study showed that practicing pranayama for twelve weeks significantly increased physical strength and endurance, as well as cardio and respiratory endurance [27]. Another research confirmed that practicing both slow and rapid pranayama for 12 weeks can enhance the features of the handgrip dynamometer, with the fast practice of pranayama becoming much more efficient than the slow practice of pranayama [28]. In contrast, a six-week period of bhasrika pranayama training had almost no impact on muscle endurance [29].

Finally, this trial is the first to compare Sheetal and Bhramari pranayama effects on serum cortisol, NO, the 30-second sit-to-stand test, diastolic and systolic blood pressures, and quality of life in hypertensive elderly subjects. In addition to being beneficial and simple to implement, 60 patients followed the treatments throughout the research. However, the results may not generalize to a broader population due to the study’s limited sample size. Future research ought to utilize a bigger sample size and research the benefits of more pranayama technique

## Conclusions

Significant improvements were recorded in both groups, but Sheetal pranayama appears more effective for lowering SBP, DBP, and serum cortisol, and increasing (NO) in hypertensive elderly. On the other hand, Bhramari pranayama appears more effective for increasing mental health in hypertensive elderly subject. Therefore, when incorporated into the subject’s lifestyle, Sheetal pranayama can be utilized as an auxiliary therapy to enhance physical fitness and health for hypertensive elderly and to lower the likelihood of future comorbidities.

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### Conflicts of Interest

The authors have no conflict of interest to declare.

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