

Review Article

Immediate effects of Pranayama on the cardiovascular parameters in hypertensive patients: A review

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ABSTRACT

Many clinical trials and studies have already been conducted and published to find out the effects of yogic practice as well as pranayama on cardiovascular system of hypertensive patients. Many studies also conducted to find out the immediate effects of yogic practice on hypertensive patients. However, a review is rarely been published to find out the immediate effects of pranayama on hypertensive patients. Searching was made through PubMed, Google Scholar, PsychINFO and Scopus using the keywords pranayama and hypertension. A total of seven studies were selected for this review from a 17 articles. Patients of essential hypertension performed different pranayama and showed a result of a significant decrease in various cardiovascular parameters such as heart rate (HR) and blood pressure (BP). It may be concluded that pranayama practice immediately reduce BP and HR.

Keywords: Hypertension, pranayama, yoga

INTRODUCTION


The word yoga is derived from the Sanskrit word 'yuj' which means 'to unite or to integrate'. It is all about harmonising the body, mind and breath through the means of various breathing exercises, yoga poses and meditation. As per the yogic scriptures, the practice of yoga leads to the union of individual consciousness with universal consciousness, indicating a perfect harmony between mind and body and man and nature. Yoga is the path as well as the aim of human life. Maharshi Patanjali, Father of Yoga, systematically compiled various aspects of yoga. According to philosophy, 'yogas chitta vritti nirodha refers to experience ultimate reality and self-realisation. He has described Astanga yoga for each and every population, and it may be common people, saints, sages or very active peoples. According to his philosophy, yoga has eight limbs yama (abstinences), niyama (observances), asana (yoga postures),

pranayama (breath control), pratyahara (withdrawal of the senses), dharana (concentration), dhyana (meditation) and samadhi (absorption). The first two limbs depict the precautions to be taken during the practice of yoga. Third limb asana strengthens muscles and prepares the body for long-time sitting. The fourth limb is pranayama. After attaining maturity in pranayama, practitioner goes towards Antaranga yoga (Dharana, Dhyana and Samadhi). It is also described that the first five limbs are Bahirang yoga and the last three are Antarang yoga.^[1,2]

Hypertension is one of the most common health disorders. It is persistent high blood pressure (BP). It is one of the major risk factors for various diseases such as stroke, coronary artery disease and organ failure.^[3] Lifestyle modification plays a major role in the management and prevention

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of hypertension. Yoga is an effective adjunct therapy for hypertension. Yoga includes asana, pranayama, meditation, relaxation, dietary changes and other techniques that have been shown to aid in reducing cardiovascular risk and high BP. Breathing techniques are increasingly being used for therapeutic purposes, and research suggests that pranayama may be especially helpful in reducing BP. Pranayama is an integral component of holistic yoga therapy schedule and involves slowing down the normal breathing rate along with an awareness based, conscious inner focus on respiration. Pranayama attempts to address the root cause of the problem rather than merely providing a symptomatic relief. Many research studies have already been published that pranayama have the immediate effects on cardiovascular system. However, a review is rarely been published to find out the impacts of immediate effects of pranayama on hypertensive patients.

MATERIALS AND METHODS

In view of the above context, extensive searches were made through PubMed and Google Scholar, to find out the immediate effects of pranayama on hypertensive patients. Each of these databases was searched using the keywords 'pranayama and hypertension' where full article was available and were downloading from that site. For inclusion in this review, studies which are written in English, which were find out the immediate effect of pranayama on hypertensive patients were selected. Exclusion criteria for the review, review articles, meta-analysis, retrospective studies and which were not concerning the immediate effect of pranayama on hypertensive patients.

DATA ABSTRACTION

Using the above-mentioned technique, 17 studies were identified and considered for initial evaluation. Among the 17 articles, six were removed because they were not considering the immediate effect of the pranayama. Among 11, four studies were excluded because they were not done on hypertensive patients. A total of seven studies met the criteria for final review.^[4-11] Figure 1 shows the data abstraction details.

RESULTS

Table 1 shows detailed results. The search yielded a total of 17 trials of which seven met criteria for initial review. In three, there was Bhramari pranayama (humming breathing), one includes sheethali and sheekari pranayama, one include pranav pranayama and another include Chandra

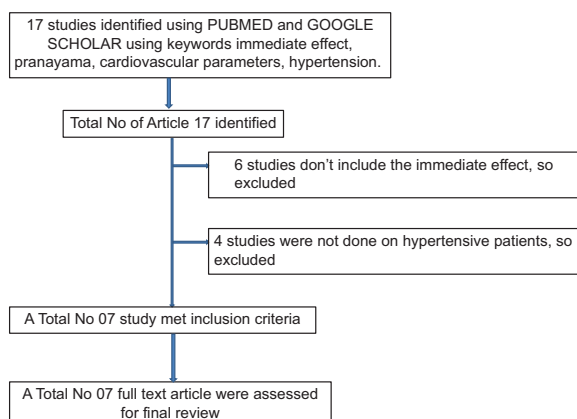


Figure 1: Schematic representation of data abstraction

Nadi pranayama. All these were on hypertensive patients of different age group. Results showed that Bhramari pranayama reduced systolic, diastolic BP and heart rate (HR) immediately following practice. A study also reported that Bhramari pranayama immediately balance autonomic nervous system and participants goes towards parasympatho-dominance as low-frequency band of HR variability (HRV) decreases and high-frequency band of HRV increases.^[4] A study reported sheethali and Sheetkari pranayama decreases all component of BP, index of load in the heart (double product [DoP]) and index of myocardial oxygen consumption (rate-pressure product [RPP]).^[7] Chandranadi pranayama also decreased all component of BP.^[9] Suryanadi pranayama decreased all component of BP except diastolic BP.^[10] A study showed that pranav pranayama and shukh pranayama decreased all components of BP.^[8,11]

DISCUSSION

The aim of this review article was to study the immediate effect of pranayama on cardiovascular parameters in patients of hypertension. From the studies, it is found that pranayama has significant effect on different cardiovascular parameters immediately after the practice of pranayama. The pranayama practices are effective in reducing HR and BP at significant rates in hypertensive patients. This might be due to balancing of autonomic function as well as improve cardiovascular rhythms as a result of increased vagal modulation and/or decreased sympathetic activity and improved baroreflex sensitivity. Such as Bhramari pranayama increased high frequency of HRV and decreased low frequency of HRV. It indicates the balance of the autonomic nervous system and practitioner goes towards parasympatho-dominance. Controlled slow breathing may modify neural respiratory elements and it lead towards parasympatho-dominance. Parasympatho-dominance may

Table 1: Details of pranayama practice and its impacts

First author, year	Population		Intervention group Practice, duration	Control group Practice, duration	Parameters studied	
	Intervention	Control			Intervention	Control
Ghati, 2020 ^[4]	35	35	Bhramari pranayama, 5 min	Placebo slow, breathing exercise	↓SBP ↓DBP ↓MBP ↓LF* ↑HF*	
Sathe, 2020 ^[5]	21	21	Buteyko breathing, 5 min	Bhramari pranayama, 5 min	↓SBP* ↓DBP ↓HR* ↑SpO ₂ *	↓SBP ↑DBP ↓HR ↑SpO ₂
Sathe, 2020 ^[6]	20	20	Bhramari pranayama, 5 min	-	↓SBP* ↓DBP ↓HR ↑SpO ₂	↓SBP ↓DBP ↓HR ↑SpO ₂
Naveen Kumar, 2018 ^[7]	20	20	Sheethali and Sheetkari pranayama 10 min (9) round + 10 min (9) round	Normal breathing, RR 12/16 min	↓SBP* ↓DBP* ↓HR ↓PP* ↓MAP* ↓RPP* ↓DoP*	↓SBP* ↓DBP* ↓HR ↓PP ↓MAP ↓RPP* ↓DoP*
Bhavanani, 2012 ^[10]	22		Chandra Nadi pranayama (27 round)		↓HR* ↓SBP* ↓DBP ↓PP* ↓MP* ↓RPP* ↓DoP*	
Bhavanani, 2012 ^[11]	20		Surya Nadi pranayama (5 min)		↓HR ↓SBP ↑DBP ↓PP ↓MP ↓RPP ↓DoP	
Bhavanani, 2012 ^[12]	29		Pranav pranayama (5 min)		↓HR* ↓SBP* ↓DBP ↓PP* ↓MP* ↓RPP* ↓DoP*	
Bhavanani, 2011 ^[9]	23		Sukh pranayama (5 min)		↓HR* ↓SBP* ↓DBP ↓PP* ↓MP* ↓RPP* ↓DoP*	

HR: Heart rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MAP: Mean arterial pressure, RPP: Rate-pressure product, PP: Pulse pressure, SpO₂: Oxygen saturation, MBP: Mean blood pressure, RR: Respiratory rate, DoP: Double Product, MP: Mean blood, Pressure, LF: Low Frequency, HF: High Frequency. * denotes Significant change. ↓ denotes decrease, ↑ denotes increase.

decrease BP and HR immediately. A study includes HRV suggest this fact.^[4]

Controlled breathing in different pranayamas may increase intrathoracic pressure. This may lead to more blood flow to the heart and it subsequently increases the stroke volume. Accordingly, it may increase cardiac output. It may also a possible reason for reduction of BP. A study demonstrated that pranayama increases the production and release of nitric

oxide. Nitric oxide may help to dilate the blood vessels. Dilatation of the blood vessels may lead to decrease BP. Previous studies describe long-term yogic practices reduced BP.^[12,13]

Another possible mechanism to decrease BP may be the reduction of stress. Pranayama plays a major role in the reduction of stress through hypothalamo–pituitary–adrenal axis. Previous studies are also proved this fact. Pranayama

practices also reduce oxygen consumption, which may lead to decrease demand, transport and supply of oxygen. It may be another cause for the reduction of BP.

RPP and DoP reduced significantly immediately after pranayama practice. This may be due to decrease myocardial oxygen consumption and load in the heart. Yogic practice may lower the strain in the heart. Previous studies also suggest this fact.^[8,11]

These findings have potential therapeutic applications in day-to-day as well as clinical situation where BP needs to be brought down at the earliest. These simple and cost-effective techniques may add to the management protocol of hypertension in addition to regular medical management.

CONCLUSION

It may be concluded that different pranayamas has the major role to control the BP immediately in essential hypertensive patients. It may also reduce the load in the heart and myocardial oxygen consumption. Some studies also reported that SpO₂ may immediately increase following pranayama practice.

Study limitations

This review, however, has identified only study involving hypertensive patients and it also does not include secondary hypertensive condition. Although some probable mechanism has been discussed, a single experimental study has not been conducted to find out the mechanism.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Bharati SV. Yoga Sutra of Patanjali. Vol. 1 & 2. Pennsylvania: Himalayan International Honesdale; 1986.
2. Pal R, Gupta N. Yogic practices on oxidative stress and of antioxidant level: A systematic review of randomized controlled trials. *J Complement Integr Med* 2017;16:1-11. [./j/cim](https://doi.org/10.1177/108998011770079). 2019.16.issue-4/jcim-2017-0079/jcim-2017-0079.xml.
3. Whelton PK, Carey RM, Aronow WS, Casey DE Jr., Collins KJ, Dennison Himmelfarb C, *et al.* 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APHA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: Executive summary: A report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines. *Hypertension* 2018;71:1269-324.
4. Ghati N, Killa AK, Sharma G, Karunakaran B, Agarwal A, Mohanty S, *et al.* A randomized trial of the immediate effect of Bee-humming breathing exercise on blood pressure and heart rate variability in patients with essential hypertension. *Explore (NY)* 2021;17:312-9.
5. Sathe SS, Rajandekar T, Thodge K, Bhawane A, Thatere U. Immediate effect of Buteyko breathing and Bhramari Pranayama on blood pressure, heart rate and oxygen saturation in hypertensive patients: A comparative study. *Indian J Forensic Med Toxicol* 2020;14:7106-11.
6. Sathe S, Thodge K, Rajandekar T, Agrawal A. To find out immediate effect of Bhramari Pranayama on blood pressure, heart rate and oxygen saturation in hypertensive patients. *Int J Curr Res Rev* 2020;12:193-7.
7. Naveen Kumar M, Thanalakshmi J, Kannan R, Mahesh Kumar K, Aadhyanth R, Vijayalakshmi B. The immediate effect of Sheethali and Sheethkari Pranayama on blood pressure and cardiovascular changes among hypertensive patients. *Int J Res Pharm Sci* 2018;9:1249-52.
8. Bhavanani AB, Sanjay Z, Madanmohan . Immediate effect of Sukha Pranayama on cardiovascular variables in patients of hypertension. *Int J Yoga Therap* 2011;21:73-6.
9. Bhavanani AB, Madanmohan, Sanjay Z. Immediate effect of Chandra Nadi Pranayama (left unilateral forced nostril breathing) on cardiovascular parameters in hypertensive patients. *Int J Yoga* 2012;5:108-11.
10. Bhavanani AB, Madanmohan, Sanjay Z. Suryanadi Pranayama (right unilateral nostril breathing) May be Safe for Hypertensives. *J Yoga Phys Ther* 2012;2:118.
11. Bhavanani AB, Madanmohan, Sanjay Z, Basavaraddi IV. Immediate cardiovascular effects of Pranava Pranayama in hypertensive patients. *Indian J Physiol Pharmacol* 2012;56:273-8.
12. Pal R, Singh SN, Chatterjee A, Saha M. Age-related changes in cardiovascular system, autonomic functions, and levels of BDNF of healthy active males: Role of yogic practice. *Age (Dordr)* 2014;36:9683.
13. Selvamurthy W, Sridharan K, Ray US, Tiwary RS, Hegde KS, Radhakrishnan U, *et al.* A new physiological approach to control essential hypertension. *Indian J Physiol Pharmacol* 1998;42:205-13.