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Review Article

Therapeutics Role of *Chandra Anulom-Vilom (CAV) Pranayama* in Essential Hypertension: A Hypothesis

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ABSTRACT

Yoga is becoming increasingly popular for treating various health issues. One important part of yoga is Pranayama, or controlled breathing, which has caught the attention of researchers. Slow Pranayama techniques like Savitri, Sitkari, Anuloma Viloma, and Nadisuddhi (Alternate Nostril Breathing) are well known. Some of these techniques are especially noted for their therapeutic benefits, including Nadisodhan (Alternate Nostril Breathing), Surya Anulom Vilom (SAV), and Chandra Anulom Vilom (CAV), also called Right nostril breathing (RNB) and Left Nostril Breathing (LNB) respectively. CAV also called left nostril breathing surges parasympathetic tone and inhibits sympathetic activities. Here, author hypothesized that CAV can reduce blood pressure and have therapeutics role in hypertensive patients. Proposed CAV technique can be used as therapy to reduce BP among Hypertensive patients. This has to be established with more extensive evidence-based researches which is under process. This paper, focuses on the therapeutic uses of these pranayama methods, especially CAV. Several researches showed that CAV decreases BP, HR and RR.

Keywords: Alternate nostril breathing, Chandra Anulom Vilom (CAV), Hypertension, Nadisodhan Pranayam, Pranayama, Yoga, Yogic breathing

INTRODUCTION

Modern medicine has made significant progress in controlling infectious diseases, including HIV/AIDS, which was once a major global health threat. However, the focus has

now shifted to non-communicable diseases (NCDs) linked to diet and lifestyle, such as diabetes and hypertension [1]. Rapid urbanization has played a significant role in this shift, leading to increased stress levels and the rise of stress-related disorders, which have a high morbidity rate and threaten to disrupt daily life. Among these, hypertension stands out as one of the most prevalent conditions worldwide. It is a major risk factor for cardiovascular and cerebrovascular diseases, both of which contribute to the global burden of disease [1-2].

The global prevalence of hypertension has seen a staggering rise over the past few decades. Between 1990 and 2019, the number of people living with hypertension defined as having a blood pressure of 140/90 mmHg or higher, or those taking medication for hypertension doubled, from 650 million to 1.3 billion. [3]. More than three-quarters of adults with hypertension now live in low- and middle-income countries, where access to healthcare and resources for prevention and treatment can be limited. Shockingly, nearly half of people with hypertension globally are unaware of their condition. [1, 3-4].

This lack of awareness is a major barrier to timely intervention, as untreated hypertension can lead to severe complications like myocardial infarction, renal failure, stroke, and heart failure [1, 4].

Even though pharmacological treatment remains the foundation of hypertension management, it often comes with limitations such as side effects, poor adherence, and financial burden particularly in low- and middle-income countries [1]. This growing burden emphasizes the need for effective, low-cost, and accessible non-pharmacological interventions. Lifestyle modifications, physical activity, including dietary changes, and stress reduction, are increasingly accepted as vital components of hypertension management [3]. In this milieu, various yogic practice such as *Pranayama***,** a form of controlled yogic breathing technique, is being suggested for their potential therapeutic benefits [5].

Slow Pranayama involves regulated breathing techniques that influence the autonomic nervous system, promoting parasympathetic activity and reducing sympathetic overdrive—key mechanisms implicated in the pathophysiology of hypertension [5-6]. Preliminary studies suggest that regular practice of Slow Pranayama like S*itkari Pranayama, Savitri Pranayama*, *Anuloma Viloma Pranayama*, *Nadisuddhi Pranayama*, *Chandra Anulom Vilom Pranayama* (CAV), may lead to reductions in blood pressure improvement in heart rate variability and decreased perceived stress levels via autonomic modulation i.e. by suppression of sympathetic nervous system and rise in parasympathetic activity [5-9]. Despite promising findings, scientific evidence remains limited and often methodologically inconsistent.

The increasing prevalence of hypertension, its complications and the need for holistic treatment options, there is a persuasive need to systematically explore and validate the efficacy of Pranayama as a complementary and or adjunct therapy [5]. High-quality research is essential to establish standardized protocols, understand underlying mechanisms, and evaluate long-term outcomes. This study aims to contribute to the growing body of evidence supporting slow type Pranayama especially Chandra Anuloma-Viloma Pranayama as a viable, cost-effective, and sustainable intervention for the management of hypertension.

Hypothesis/theory:

Several researches showed that CAV decreases BP, HR and RR [10-11]. CAV also called left nostril breathing exercises surges parasympathetic tone and inhibits sympathetic activities [5]. Among many causes one of the causes of essential hypertension is excessive sympathetic activity. Here the author hypothesized that CAV can reduce blood pressure and have therapeutics role in essential hypertensive patients.

Pranayama

The ancient science of Yoga includes a powerful practice known as *Pranayama*, which involves the voluntary regulation of breath to create rhythm in respiration and to calm the mind [12]. This practice focuses on breathing techniques that help balance both physical and mental states.

The term *Pranayama* is derived from two Sanskrit words: *Prana* and *Ayama*. *Prana* means "life force," the vital energy that sustains all living beings, and *Ayama* means "to control" or "to extend." Therefore, *Pranayama* can be understood as the control or extension of the life force, *Prana* [5, 12]. In this context, *Prana* is not just air or breath, but the vital energy that animates life. Without *Prana*, a body is merely a cadaver, devoid of life. It is the presence of *Prana* that makes us alive [5].

Patanjali, foremost exponent of Yoga in his Yogasutra (Verse II, 49), described pranayama as “Tasmin sati śvāsa-praśvāsyor-gati-vicchedaḥ prāṇāyāmaḥ” which means pranayama is the gradual unforced cessation of breathing. The inspiration of prana is Swasa and expiration is praswasa and cessation of breath (inspiration and expiration) is characteristic of pranayama [5, 13-14]. Unlike natural breathing, Pranayama encompasses conscious inhalation (puraka), exhalation (rechaka), and breath retention (kumbhaka) - either internal (antah kumbhaka) or external (bahih kumbhaka). This methodical approach aims to control breath parameters like depth and frequency, influencing the flow of vital energy (prana) [15-16]

Pranayama is a yogic-practice of transforming the breathing pattern. Nevertheless, it has vast meaning than this. Various, yogic text from where the word *Pranayama* is foraged, takes *Prana* as a subtler entity which flows in *Prana*mayakosa (Pranic body), one of the five layers of existence. Ayurveda explains Annamayakosa, *Prana*mayakosa, Manomayakosa, Vijnanamayakosa, and Anandamayakosa as five layers of existence of human identity [5, 17]. *Prana*mayakosa also called Pranic body consists of 7.2 million (72 lakhs) *Nadis* and 7 *Chakras*. The Subtle energy- the ‘*Prana*’ flows through these *Nadis* and *Chakras*. They can be compared and correlated with Nerve plexus and nerve fibers of the anatomical body but is not exactly the same [5, 16-18]. So, according to those text *Pranayama* is more specifically “Control of *Prana: the subtler energy*” and not the control of breath alone. Several western practitioners of yoga correlates *Pranayama* to breathe control as breath control is one means to physically control the *Prana* [5].

Pranayama encompasses a variety of breathing techniques, each designed to achieve specific physical and mental benefits. These techniques range from simple nostril breathing to more advanced practices like belly breathing. The exercises can be slow and calming or vigorous and energizing, such as *Bhastrika* (bellows breath) and *Kapalbhati* (skull shining breath) [5, 20].

The practice also includes variations like single nostril breathing or alternate nostril breathing, each having its own unique effect on the body and mind. The response to these exercises depends on factors such as the rate, depth, and force of the breath [20]. For example, slow, deep breathing may have a calming effect, reducing stress and promoting relaxation, while rapid, forceful breathing exercises like *Bhastrika* may increase energy and alertness. By varying these techniques, practitioners can tailor their practice to achieve different outcomes, whether it's enhancing concentration, reducing anxiety, or improving physical health [5].

Chandra Anulom Vilom Pranayama (CAV)

Chandra Anulom Vilom (CAV) *Pranayama* or Chandra Nadi Suddhi Pranayama, also known as Left Nostril Breathing (LNB), is a slow breathing exercise that belongs to the nostril breathing category. It is usually practiced sitting comfortably, with the back straight—either in *Sukhasana* or *Padmasana* posture [10-12].

The practice begins by closing the right nostril with the thumb of the right hand, then inhaling slowly through the left nostril. After holding the breath briefly, practitioner has to exhale gently through the same left nostril. Then, inhale again through the left nostril to complete one round of the practice. This process is repeated slowly, at a rate of about 5 to 7 cycles per minute [10, 21].

Some studies mention that CAV (Left Nostril Breathing) can also be performed while sitting comfortably on a chair with a straight spine [21]. It is a calming exercise that helps balance the nervous system, and its slow rhythm makes it easy to practice regularly.

Physiological effects of CAV *Pranayama*

Several studies have explored the physiological effects of Chandra Anuloma Viloma (CAV) pranayama, particularly on autonomic and cardiopulmonary functions. More fresh studies have shown that breathing through a particular nostril can modify autonomic and metabolism activities [21-23].

In a month-long study conducted by Telles et al.,[22] the effects of different Pranayama practices on metabolism and sympathetic nervous system activity were explored. The study found that the group practicing *right nostril Pranayama* showed a significant 37% increase in baseline oxygen consumption, indicating a notable activation of metabolism. The *alternate nostril Pranayama* group also experienced an 18% increase, while the *left nostril Pranayama* group showed a 24% increase.

These findings were interpreted as being linked to increased sympathetic nervous system activity, which is associated with the "fight or flight" response and is known to elevate metabolism. Interestingly, the *left nostril Pranayama* group also demonstrated an increase in volar galvanic skin resistance, suggesting a reduction in sympathetic nervous system activity, particularly in relation to the sweat glands. This indicates a more calming effect, potentially linked to parasympathetic activation, which is associated with rest and relaxation. These results suggest that selective nostril breathing may have distinct effects on the sympathetic nervous system—right nostril breathing appears to activate it, while left nostril breathing seems to inhibit or balance it.

Bargal S et al evaluated the effect of Left Nostril Breathing on cardiorespiratory parameters and reaction time in young healthy individuals and found that there was a significant reduction in Respiratory rate, Pulse rate and both Systolic and Diastolic pressure. They also observed a significant increase in Vital Capacity and Peak Expiratory Flow Rate (PEFR). There was also a significant decrement in auditory reaction time and visual reaction time (ART & VRT) too [23] suggesting improvement in cognition/alertness. There was no significant change in maximum heart rate (MHR) after cardiorespiratory activity ($p > 0.434$) which is practice dependent [23]. The decrease in ART and VRT is suggestive of improvement in higher functions. Similar improvement in higher function was also reported by Jella & Khalsa back in 1993. They revealed that cognitive performance especially spatial task performance significantly improved after CAV Pranayama among both males and females [24]. Malhotra et. al also reported modification of autonomic activity of Heart and reaction time [25].

A pilot study with 22 participants reported an instant reduction in heart rate (HR), pulse pressure and systolic blood pressure (SBP), following CAV [26]. Male participants showed a significant decrease in both HR and SBP, whereas in females, only HR decreased significantly after 27 rounds of CAV. In a comparative study on the effects of left and right nostril breathing in 40 participants, Jain et al. [27] reported that Left nostril breathing for 15 minutes resulted in significant reductions in SBP, DBP, respiratory rate, and pulse, although no significant change was observed in galvanic skin resistance. A notable increase in peak expiratory flow rate was also reported, indicating improved cardiopulmonary function due to CAV [27]. CAV has been reported to increase volar galvanic skin resistance which can be interpreted as a decrease in sympathetic activity supplying the sweat glands [28]. Similar finding and interpretation is reported in a next study done in India [22].

In a randomized controlled trial with 45 healthy individuals, a significant decrease in SBP was observed after practicing 90 rounds of CAV for 15 minutes [29]. In a study by Pai et al, 2024 [21] done on normotensive subjects, there has been a significant reduction in Systolic and Diastolic Pressure post-intervention in the CAV group which was higher than changes among SAV and ANB group. The study provides overall understandings of the potential benefits of specific nostril breathing *Pranayama* on hemodynamic changes in normotensive individuals. It indicates that such techniques could be beneficial in managing Blood Pressure and overall hemodynamic status [21]. Similar result was shown by a next study done by Prakash & Upadhyay-Dhungel. The study depicted drop in Pulse rate, respiratory rate, systolic and diastolic blood pressure after CAV *Pranayama.* The change was more prominent on yoga Practioners than the Naïve [10]. Similar was the finding of other research [11] too suggestive of the fact that regular practice is needed to see the better outcomes of CAV Pranayama.

Overall, the health-promoting effects of pranayama practices like CAV appear to be mediated primarily through improvements in autonomic function [28-30]. Additionally, recent research supports the idea that long-term unilateral nostril breathing practices can exert specific influences on autonomic regulation [29-30].

All the review of literature related to effect of CAV Pranayama suggests that- it can be used

as an adjunctive therapy to improve symptoms associated with cardio-respiratory and autonomic disorders [22-30].

Yogic explanation of effect of CAV *pranayama*:

When the practitioners complete the respiratory cycle of inhalation and exhalation through the right nostril exclusively then it is called "*Surya Anuloma Viloma Pranayama (SAV)".* Surya literally means Sun, which is regarded as the heat generating body of our solar system. *So SAV literally* implies "heat generating breathing practice" [5, 10]. When the practitioners completes the cycle of inhalation-exhalation through the left nostril alone, the practice is called "*Chandra Anuloma Viloma Pranayama* (CAV)" which means cooling or a heat dissipating practice. As Chandra means Moon which is believed to have cooling effect [5, 11].

In the yogic system of breathing, the right nostril dominance corresponds to activation of '*Pingala*' nadi (subtle energy channel); related to sympathetic arousal and left nostril to '*Ida*' subtle energy channel, corresponding to parasympathetic activation [5]. CAV stimulates Chandra Nadi i.e. 'Ida' subtle energy Channel leading to Cooling effect in body triggered by Parasympathetic stimulation leading to decrease in SBP, DBP, PR, HR and improvements in respiratory parameters [5, 10-11].

Li et al. (2018) conducted a comparative study on heart rate variability (HRV) between individuals with essential hypertension and healthy controls. Their findings suggested that slow breathing exercises could have a beneficial effect on autonomic regulation in hypertensive individuals. Specifically, slow breathing was found to decrease low-frequency (LF) power and increase high-frequency (HF) power, as well as lower the LF/HF ratio in hypertensive subjects. These changes indicate a shift towards greater parasympathetic (vagal) activity and a reduction in sympathetic nervous system dominance, which is commonly elevated in essential hypertension.

In addition to these changes in HRV, the study also demonstrated an increase in baroreflex sensitivity in the hypertensive group after engaging in slow breathing exercises. Baroreflex sensitivity is a key indicator of the body's ability to regulate blood pressure through autonomic mechanisms. The increase in this sensitivity suggests that slow breathing helps to improve the body's ability to maintain stable blood pressure by enhancing parasympathetic (vagal) activity and reducing the overactivity of the sympathetic nervous system.

This shift towards a more balanced autonomic response—favoring vagal (parasympathetic) activity—could provide a potential explanation for the beneficial effects of CAV on hypertension, including the observed cardiovascular benefits. These findings suggest that slow, controlled breathing as in CAV may be a valuable complementary approach in managing essential hypertension by improving autonomic regulation and reducing sympathetic dominance [9, 21].

CONCLUSION

CAV as a simple breathing exercise can be used as a beneficial adjuvant to pharmacological therapy in essential hypertensive patients. This opens a new space of future research in the better management of patients with essential hypertension.

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