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# Effect of Pranayama on Cardiovascular Parameters among Indian Population- A Narrative Review

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## ABSTRACT

Pranayama is one among the breathing exercise practised in Yoga, which can control breathing voluntarily. This narrative review based on the scientific research findings used as the methodology in this study. The online data sources including Pubmed, Pubmed Central, Cochrane, Medline, Google Scholar were searched for the related studies. After applying the inclusion and exclusion criteria we got 30 related studies on the topic. The studies showed that there is an effect of pranayama on the cardiovascular parameters among the healthy as well as the hypertensive patients. Some types of pranayama affect the parasympathetic system and some types stimulate the sympathetic system. The Surya Anuloma Viloma or Surya Bhedana, Chandra Anuloma Viloma or Chandra Bhedana, Surya Nadi effect to increase the heart rate and Blood pressure. The alternative nostril breathing, Chandra Nadi pranayama, nadishuddhi, slow and fast pranayama effect to reduce the heart rate and blood pressure. Most of the studies show that pranayama affect blood pressure and a trained nurse can utilize the techniques in lowering the blood pressure level both in the clinical setting and in community.

**Key Words:** Pranayama, Systolic blood pressure, Diastolic blood pressure, Heart rate, Oxygen consumption, Hypertension

## INTRODUCTION

Globally cardiovascular diseases are the major cause of death among the world population. In 2016 around 17.9 million people died due to the same problem. It is around 31% of all death globally. For reducing the Non -communicable disease burden, all the WHO member countries (194) in 2013 agreed that a global action plan for the prevention and control of Non-communicable Disease by 2020. The main focus of this plan is to reduce premature death due to Non-communicable Disease by 25% by 2025. Also, another focus is to reduce 25%of the world prevalence rate of high Blood pressure. In 1975 the number of adults with raised Blood pressure was 594 million that increased to 1.13 billion in 2015.[1]

In India, around 52% of death occurs before the age of 70 years due to cardiovascular diseases. But in the Western population, the percentage was only 23%. The severity of cardiovascular diseases is more in low-income countries like India when compared to the high and middle income countries.[2]Cardiovascular diseases related conditions make the two-third burden of Non-communicable Disease in India. The cardiovascular diseases death rate in India is around 272 per 100000 populations which is higher than the world's average death rate due to cardiovascular diseases of 235 per 100000 populations. Among the cardiovascular diseases death rate 255-525 per 100000 populations in men and 225-299 per 100000 populations in women.[3]

India has contributed more variety to the world especially Zero in mathematics, Ayurveda, Yoga in health etc. Among this golden contribution, Yoga is playing a pivotal role in the prevention of cardiovascular diseases. Breathing exercises are an important part of Yoga.

## PRANAYAMA AND RELATED PHYSIOLOGICAL EFFECTS

Pranayama is one among the breathing exercise practised in Yoga, which can control breathing voluntarily. The word Pranayama formed from Parana means source in the body and Ayama means breath control.[4] The respiratory cycle is an ultradian rhythm in which the cycle is repeating 24 hours in

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a day. In this cycle, the air entry through the patent right and left nostril are called the nasal cycle. The forced breathing via the right nostril block the left one was found to raise the blood sugar level and the heart rate of the individual. The left nostril has the reverse effect.[5]

The pranayama technique in the yoga is about to inhale and exhale through the alternative nostrils exclusively. Right nostril breathing pranayama practising for 40 minutes per day for months affect that different from the left nostril breathing pranayama/ Chandra Anuloma Viloma, and these two techniques are again different from the alternative nostril breathing pranayama or Nadishuddhi. These all three pranayama technique can practice at the same duration and frequency. When considering the oxygen consumption, the Surya Anuloma Viloma is causing more (37%) than the other two types that are 24% and 19% respectively. Also when considering the Surya Anuloma Viloma, Chandra Anuloma Viloma and Nadishuddhi, the Surya Anuloma Viloma and Chandra Anuloma Viloma have more effect on weight reduction (2.3 Kg) than the Nadishuddhi (1.5 Kg). This is suggesting that we can recommend these practice to reduce body weight.[6]

## METHODOLOGY

A narrative review based on the scientific research findings used as the methodology in this study. Mainly the online data sources including Pubmed, Pubmed Central, Cochrane, Medline, Google Scholar were searched for the related studies. We searched for the keywords pranayama, cardiovascular parameters, and healthy people and hypertensive patients for the study review. We searched the article until October 2019. Studies related to any type of pranayama, experimental studies, studies available in Pubmed, Pubmed Central, Cochrane, Medline, Google Scholar database, studies finding the effect of pranayama on cardiovascular parameters like heart rate systolic and diastolic blood pressure and oxygen consumption were included in this review and the studies, not an experimental study, other yoga effects on cardiovascular parameters, full text not available studies, other databases not in the inclusion criteria, repeated studies were excluded from the review. After applying the inclusion and exclusion criteria we got 30 related studies on the topic.

## EFFECT OF PRANAYAMA ON CARDIOVASCULAR PARAMETERS

### Pranayama and sympathetic stimulation

Surya anuloma pranayama or right nostril pranayama effect on cardiac parameters was assessed among the group with no comorbidities. In which the first group practised Surya Anuloma Viloma for 45 minutes on the first day and normal breathing on the second day for same 45 minutes. In the second group, the first day went for normal breathing followed by next day Surya Anuloma Viloma. They showed that the systolic blood pressure and the oxygen consumption is increased after Surya Anuloma Viloma but not after the normal breathing session.[6] In another group of men in the age group between 25-48 years. They randomly divided into 3groups, in which the first group practised the right nostril breathing left nostril breathing and alternative nostril breathing for 27 cycles, 4 times per day for one month. They had a significant increase in baseline oxygen consumption of 37% in the right nostril breathing group, 24% in the left nostril breathing group and around 18% in the alternative nostril breathing group. When comparing the heart rate among these groups showed that there is an increase in HR after one month of the breathing exercise.[7]

### Pranayama and parasympathetic stimulation

The different types of pranayama are having a variety of cardiovascular changes in the human body. A study conducted by Madanmohan et al and Pal et al showed that the slow and deep breathing exercise can produce a significant reduction in Blood Pressure and Heart Rate after a continuous practice for 3 weeks and 3 months respectively. It also showed that the Chandra Nadi Pranayama effect reducing the heart rate and Blood Pressure among patients with hypertension.[8,9]A study was conducted among the 15 volunteers showed that the alternative nostril breathing can reduce the Systolic Blood Pressure.[10] The Chandra Nadi Pranayama is the method in which the air is breathing through the left nostril alone. The cooling breath practices of the Chandra Nadi Pranayama are Sheetali and sheetkari effect reducing the BP without causing any adverse effect.[11] The major difference between the Sheetali and Sheetkari are inhaling the cool air through the folded tongue and inhaling through the side of the mouth with a closed tooth respectively.[12]Among hypertensive patients in the age group between 25 to 65 years practised two types of pranayama, Sheetali and Sheetkari pranayama each around 10 minutes per day. They showed that there is a decrease in the Heart Rate and Systolic Blood Pressure after the intervention.[13]

Bhramri pranayama is a type of pranayama in which the person inhaling through both nostrils and exhaling produce the sound of a humming bee. A group of volunteers with a mean age of 23.50 and the age 18 years and above with no comorbidities practised the bhramri pranayama and their Heart Rate, Systolic Blood Pressure and Diastolic Blood pressure were decreased after their pranayama.[14]The immediate effect of bhramari pranayama on resting cardiovascular parameters in healthy adolescents was conducted by Kuppusamy et al. In the experimental group they done the bhramari pranayama for 45 minutes that is 5 cycles and in the control group done the normal breathing, it was about 12-16 breaths per

minutes. After 5 minutes of rest in the supine position, the Heart Rate and Blood Pressure checked. The adolescents had a significant reduction in the Blood Pressure and Heart Rate in the experimental group.[15]

School children were randomly selected to evaluate the effect of pranayama training. The students were divided into pranayama group and a control group. In the pranayama group, the students were underwent training on Nadishuddhi, Mukh- Bhastrika, Pranav and Savitri pranayamas, practised 20 minutes daily for 3 months. The results showed that the pranayama training modulates ventricular activity by increasing the parasympathetic activity.[16] Bhavanani et al conducted a study among yoga trained subjects on effects of uninostril and alternative nostril pranayama on cardiac parameters. The study participants came to the lab on 6 days and checked their heart rate and blood pressure after the pranayama. The different pranayama includes Right Unilateral Breathing, (Surya Nadi), left Unilateral Breathing, (Chandra Nadi), Right initiated Alternative Nostril Breathing (Surya Bhedana) and left initiated Alternative Nostril Breathing (Chandra Bhedana), Nadi Shuddhi, and Normal Breathing. They showed that there is the reduction in Heart Rate and Blood Pressure following Chandra Bhedana, Chandra Nadi and Nadi Shuddhi with concurrent increase following Surya Bhedana and Surya Nadi.[17] Medical students in (age 18-20 years) practised the nadishodhana pranayama for 10 weeks. They showed that there is a significant decrease in the Heart Rate, Systolic Blood Pressure and Diastolic Blood pressure after the pranayama training.[4] A similar study among healthy young adults showed that after the 12 weeks training of alternative nostril breathing there is a significant decrease in the Heart Rate, Systolic Blood Pressure and Diastolic Blood pressure.[18] Effect of alternative nostril breathing for 15 minutes for 8 weeks along young adults showed that there is a significant decrease in the Heart Rate and Systolic Blood Pressure among both male and female groups and a non-significant decrease in the Diastolic Blood pressure in both groups.[19]

Right, and left nostril breathing pranayama effect on the cardiac, respiratory and autonomic values among the healthy young adults in the age group 17-22 years also had a similar effect. In which one group practising right nostril breathing and the other group practising left nostril breathing, they practised 15 minutes daily for 8 weeks and after the training programme, they showed that there is a decrease in the Heart Rate, Systolic Blood Pressure and Diastolic Blood pressure in both group.[20]

## CONCLUSION

There is an effect of pranayama on the cardiovascular parameters among the healthy as well as the hypertensive patients. Some types of pranayama affect the parasympathetic system and some types stimulate the sympathetic system. Most of the studies are in a short duration effect only checked. Considering the benefits of the pranayama on the cardiovascular parameters a large scale sample with a long period studies are warranted with strong study design to control the extraneous variables. Nurse practitioners may be trained on pranayama and can utilize the techniques in reducing the blood pressure.

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