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# THE SCIENCE OF SERENITY: EXPLORING YOGA'S THERAPEUTIC IMPACT ON HIGH BLOOD PRESSURE

**[*1]Dr. Anukeerth M., [2]Dr. Sushmitha Bharadwaj H. G., [3]Dr. Rakshith K. R. and [4]Dr. Sajitha K.**

[1]PG Scholar, [2]PG Scholar, [3]Associate Professor, [4]HOD & Principal of Department of PG Studies in Swasthavritta, [1]Sri Sri College of Ayurvedic Science and Research, Bengaluru, Karnataka, India 560082.

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***Corresponding Author**
**Dr. Anukeerth M.**
PG Scholar, Department of PG Studies in Swasthavritta, Sri Sri College of Ayurvedic Science and Research, Bengaluru, Karnataka, India 560082.

## ABSTRACT

Hypertension, or high blood pressure, affects millions worldwide and it is a leading risk factor for cardiovascular disease. Both non-pharmacological and pharmacological treatment options are available to treat hypertension. While medication is often necessary, complementary therapies like yoga are gaining recognition for their potential in managing hypertension. Yoga, an ancient practice that combines physical postures, breathing exercises, and meditation, offers a holistic approach to health that can positively impact blood pressure levels. Through its stress-reducing effects and promotion of relaxation, yoga has emerged as a promising adjunctive therapy for hypertension. This article explores the therapeutic role of yoga in hypertension, examining its physiological effects, evidence-based benefits, and practical applications in clinical settings.

**KEYWORDS:** Hypertension, Yoga, Pranayama, Mudra, Bhanda.

## INTRODUCTION

Hypertension, commonly known as high blood pressure, is a significant global health challenge, affecting millions and contributing to severe cardiovascular complications. While pharmacological treatments remain the cornerstone of management, the increasing prevalence of hypertension highlights the need for complementary and preventive strategies. Yoga, an ancient practice rooted in physical postures, breathing techniques, and meditation, offers a holistic approach to managing this condition.

Research has shown that yoga not only aids in stress reduction but also improves cardiovascular health, lowers blood pressure, and enhances overall well-being. By addressing the mind-body connection, yoga serves as a powerful adjunctive therapy in mitigating hypertension's risk factors.

This article explores the mechanisms, evidence, and practical applications of yoga as a therapeutic intervention for hypertension, emphasizing its role in promoting a healthier and more balanced lifestyle.

## RECOMMENDED YOGA PRACTICES IN HYPERTENSION

### 1) SHATKRIYA (YOGIC CLEANSING PRACTICES)

Shat kriyas are the yogic cleansing techniques described in the Hatha Yoga texts. It is believed that regular internal cleansing enhances the functional capacity of the organs. There are limited scientific evidence on the efficacy of these practices in hypertension. Trataka (concentrated gazing) practice has been recommended for hypertension.

- **Trataka**

- Trataka kriya showed Significant result in reduction of BP and HR in patients with primary hypertension, it Induces calmness similar to a mental state during meditation.[1]
- Duration- 10 to 15 min.

- **Jala neti**

- Jala neti can be practiced once a week, however, other cleansing techniques are contraindicated.[2]
- Duration- 5 mins
- Neti kriya Clears up the head and neck region producing a sense of lightness, it improves breathing, potentially enhancing oxygenation. Better oxygenation can benefit cardiovascular health and help manage blood pressure.
- **Enhancing Nitric Oxide (NO) Production**- Nitric oxide is a molecule that plays a role in vasodilation. It is produced in various tissues, including the nasal mucosa. Some studies have found that nasal irrigation can increase NO levels in the nasal cavity.[3]
- So Jala neti enhance NO production in the nasal passages, contributing to improved blood vessel function.

**1) SHARIRA SANCHALANA** (WARM-UP PRACTICES)

- Toe bending, ankle bending, knee bending, wrist bending, elbow bending, shoulder rotation, and neck movements in a seated position with synchronization of breathing can be done.
- Duration - 5 to 10 min
- These are the loosening exercises that relieve stiffness and prepare the body for the practice of asana.
- They also helps to ease the tension accumulated in different body areas, thus improving the blood circulation.

**2) SURYA NAMASKARA**

Fast suryanamaskara produced a significant increase in systolic pressure, pulse pressure and and rate pressure product.

On the other hand, slow suryanamaskara produced a significant decrease in diastolic pressure but there was no significant change in systolic pressure or rate-pressure product.

Thus it was evident that the cardiovascular response to suryanamaskara depends on the manner in which it is performed.

Slow suryanamaskara is beneficial to the heart and hence can be prescribed to hypertensive patients and for rehabilitation of cardiac patients.[4]

**3) CHAIR SURYANAMASKARA[5]**

- The technique of Chair -Suryanamaskar involves slow and deep breathing along with the 12 poses.
- Steps-

- Pranamasana, Hasta Utanasana, Pada hastasana, Pada Pawana Muktasana, Paschimottanasan and Maha Veerasana (Great Warrior Pose).

**Figure. 01.**

- While practicing Chair Suryanamaskar one concentrates on the act of breathing which removes attention from worries and Stress.
- Slow breathing induces a generalized decrease in the excitatory pathways regulating respiratory and cardiovascular systems.
- As respiratory and cardiovascular systems have similar control mechanisms, alteration in one system will modify the functioning of the other.

- When the body is calm and relaxed, parasympathetic nerve activity become more active than the sympathetic activity, which helps in the reduction of blood pressure.
- During slow and deep breathing the lungs inflate fully. This activates receptors in the lungs (pulmonary stretch receptors), which reduces the activity of the sympathetic nerves in the blood vessels of the muscles.
- This causes the blood vessels to widen, reducing resistance and lowering the diastolic blood pressure.

**4) ASANA**

➢ **Asana for relaxation**

- Shavasana
- Supta baddha konasana (Reclined bound angle pose)
- Upvistha konasana (Wide-angled seated forward bend)
- Balasana (Child's pose)
- kapotasana (Supported pigeon pose)

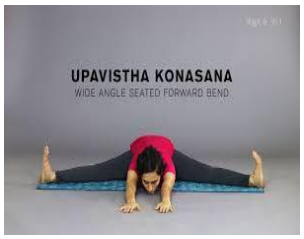
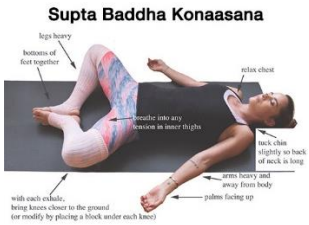



**Fig:02**

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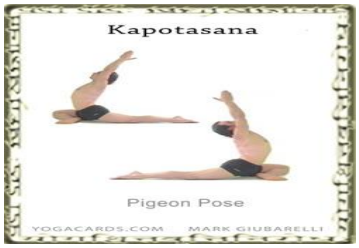


**Fig:04**

➢ **Asana for relaxation**

- Shavasana
- Supta baddha konasana (Reclined bound angle pose)
- Upvistha konasana (Wide-angled seated forward bend)
- Balasana (Child's pose)
- kapotasana (Supported pigeon pose)


**Fig:05**

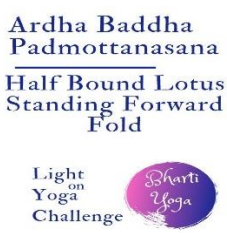


**Fig:06**


**Fig:07**

➢ **Standing postures**

- Tadasana (Palm tree pose)
- Tiryak tadasana (Swaying palm tree pose)
- ArdaKatichakrasana (Standing spinal twist)
- Ardhachakrasana (Standing backward bend) Synchronizing the movements with the breathing cycle.

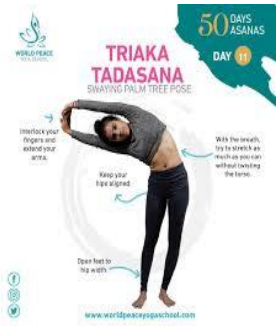


**Fig:08**


**Fig:09**

➢ **Sitting postures**

- Vakrasana (Seated spinal twist);
- Gomukhasana (Cow face Pose);
- Ardha Ushtrasana (Half camel pose);
- Pashchimottanasana (Seated forward bend)
- Marjarasana (Cat stretch)

➢ **Prone postures**

- Bhujangasana (Cobra pose);
- Tiryak bhujangasana (Swaying cobra pose);
- Ardha Shalabhasana (Half locust pose)

➢ **Supine postures**

- Pavanmuktasana (Wind releasing pose);
- Eka and Dwipada uttaanpadasana (straight single and both legs raising)



**Fig:11** **Fig:12** **Fig:13**

**Research benefits of asana in HTN**[6]

- Based on research these asanas showed reduction in systolic BP and saw similar reductions in diastolic BP, and HR but returned to baseline after 24 hours.
- The **restorative yoga** group saw significantly greater reductions in systolic BP.
- Quiet relaxation had minimal effects on HR, diastolic BP or systolic BP.
- Stretching and restorative yoga both appeared to reduce BP and HR. However, restorative yoga appeared to have significantly greater reductions. These reductions in BP and HR in the restorative yoga group persisted 24 hours later.
- This suggests the potential of restorative yoga as a therapeutic option for hypertensive patients.
- Holding yoga postures for a few seconds build strength by using body weight for resistance, which in turn slows the onset of **sarcopenia.**
- Sarcopenia is the age-related loss of muscle mass, strength, and function.
- Sarcopenia may contribute to the development or worsening of hypertension, because the Muscle tissue is metabolically active, and loss of muscle mass can lead to metabolic changes that may affect blood pressure regulation.
- Yoga practices slows down the onset of sarcopenia, it may reduce hypertension is through the maintenance of muscle mass and function
- Holding yoga postures exert controlled pressure on the kidneys and the adrenals, which regulates BP through secretions of hormones like renin, angiotensin, adrenaline, etc.
- Forward bending asanas with head supported brings a sense of calm and helps in reducing stress.
- Backward bending poses Elevate low mood and have energizing effect
- Meditative postures Improves concentration and peace of mind
- So here, when the mind is calm, it Lowers **Sympathetic Nervous System Activity**
- The sympathetic nervous system is responsible for the body's stress response. When activated, it can increase heart rate and constrict blood vessels, raising blood pressure.

- So Asanas can help balance the autonomic nervous system, reducing the dominance of the sympathetic (stress) response and promoting the parasympathetic (relaxation) response, which can lead to lower blood pressure.

➢ **Improves Endothelial Function** -Chronic stress and hypertension can impair the function of the endothelium, the inner lining of blood vessels. This can lead to reduced vasodilation, `which can contribute to higher blood pressure.

- Yoga practices may help improve endothelial function, promoting better blood vessel health and lower blood pressure.

**5) PRANAYAMA**

- Slow breathing practices are effective in reducing BP and are recommended as the first line treatment for low-risk hypertensive and prehypertensive patients who are reluctant to start medication.
- Studies have shown immediate benefits in performing Meditative Postures (Sukha asana) and performing Sukha Pranayama (Easy comfortable breathing)
- Vajrasana (Thunderbolt pose)
- Ardha padmasana (Half lotus pose)
- Padmasana (Lotus pose)

➢ Deep abdominal breathing - Gentle deep inhalation and slow longer exhalation for 5 min

➢ Sukha pranayama (Easy comfortable breathing) Conscious, slow and deep breathing with equal duration for inhalation and exhalation) at the rate of 6 breaths/min

➢ DURATION- 5 min

➢ Anulom Vilom/Nadi shodhan pranayama (Alternate nostril breathing)

➢ Chandra nadi pranayama/Chandra bhedan pranayama (Left nostril breathing)

➢ Slow bhastrika pranayama (Bellows breath)

➢ Ujjayi pranayama (Ocean breath)

➢ Bhramari pranayama (Humming bee breath)

➢ Sheetali pranayama (Cooling breath) –

➢ Pranava pranayama/ AUM chanting - Slow and deep inhalation with complete yogic breathing followed by the audible vibratory resonance of a prolonged AUM chant Can be practiced in a supine position 5 min.

➢ **Research benefits of Prayanama**

- Based on study, Sukha pranayama has significant reduction in Heart rate, systolic pressure, pulse pressure and mean arterial pressure
- Immediate Effect of Nadi shodhana pranayama (Alternate nostril breathing) Reduce the BP and HR, it helps in Activating the parasympathetic nervous system and enhancing healthy cardiovascular functioning.[7]
- Bhastrika pranayama helps Reduction in systolic and diastolic BP and enhances parasympathetic activity.[8]
- Chandra nadi pranayama (Left unilateral forced nostril breathing) does an immediate decrease in cardiovascular parameters with the decrease in HR, systolic pressure, and pulse pressure.[9]
- Bhramari pranayama has Immediate positive effect on reducing the systolic BP and Parasympathetic dominance.[10]
- Ujjayi pranayama without breath retention or bandhas Significantly decreases stress-induced changes in cardiorespiratory parameters and decreases BP.[11]
- It helps in Shifting autonomic nervous control toward the parasympathetic side and it Exerts gentle pressure on the carotid sinuses that regulates BP through homeostatic mechanisms
- Sheetali pranayama has the immediate effect in reducing the systolic and diastolic BP in hypertensive patients thus Decreasing the sympathetic activity.[12]
- Pranava pranayama/AUM chanting. Five min of AUM chanting reduces systolic and diastolic BP, thus Reduces depression, anxiety, and stress, Improves quality of sleep, Promotes relaxation, and provides calmness.[13]
- So to conclude, a Slow-paced pranayama Optimally balances the sympathetic and parasympathetic nervous systems

➢ **The Baroreceptor sensitivity** can be enhanced significantly by slow breathing.

- Baroreceptors are specialized nerve endings located in the walls of blood vessels, especially in the carotid sinuses and aortic arch. They detect changes in blood pressure and helps to regulate it by sending signals to the brain, which then adjusts heart rate and blood vessel dilation.
- Pranayama enhances baroreceptor sensitivity, meaning the baroreceptors become more responsive to changes in blood pressure. This improved sensitivity allows for more effective regulation of blood pressure, leading to greater overall cardiovascular health.

- **Enhances Vagal tone** - Deep slow abdominal breathing **Improves Vagal tone**, Vagal tone refers to the activity of the vagus nerve.
- which is a key component of the parasympathetic nervous system. The vagus nerve helps regulate many bodily functions, including heart rate, digestion, and breathing
- Slow-paced breathing stimulates the vagus nerve, leading to its increased activity. This activation has a calming effect on the body, promoting relaxation and reducing stress.

### 6) MUDRA (SUBTLE GESTURES)

Mudra is a term meaning a 'bodily position' or 'subtle gesture'. Mudra can be practiced independently or incorporated into yoga postures, pranayama, and meditation.

The effects of yoga practices are enhanced with mudra, as they deepen awareness and concentration.

➢ **Shanmukhi mudra (Closing the seven gates)**

- Closing the ears with the thumbs, placing the index fingers on the eyes, the middle fingers near the nostrils, the ring fingers, and the little fingers above and below the lips
- Practiced during bhramari pranayama
- Shanmukhi mudra (Closing the 7 gates) Produces a sense of inner calm.
- This mudra encourages 'pratyahara', which means withdrawing the mind inwards by blocking the sensory distractions of the surroundings

**Fig:14.**

➢ **Brahma mudra (Divine spiritual gesture)**

- Synchronizing neck movements with deep breathing and vibration sounds
- Brahma mudra Induces a sense of relaxation and reinvigoration in the head and neck region that reduces stress.


**Fig:15.**

- **Apan Vayu Mudra (Mudra of the heart)**

- Placing the tip of the index finger at the base of the thumb and joining the tips of the middle finger, ring finger, and thumb and the little finger extended
- Apaan vayu mudra helps in Reduction of systolic and diastolic BP
- The finger position stimulates the nerves in the palm and wrist area, resulting in a systemic effect on the cardiovascular system


**Fig:16.**

- **Gyan mudra (Mudra of wisdom)**

- Joining the tips of the index finger and the thumb, other fingers extended, it should be Practiced during pranayama and meditation
- Gyan mudra Reduces mental stress, Deepens awareness, Enhances meditation experience, Regulates the fire and air elements in the body
- DURATION- Up to 30 min a day


**Fig: 17.**

**7) DHYANA**

There are two major types of meditation- concentration and mindfull meditation.

- **Concentration meditation –** It involves a focus on a word, sound, prayer, or phrase.
- It emphasizes in developing a passive attitude towards intruding thoughts, emotions, or body sensations.

Examples: AUM japa, Ajapa japa, Anahata (heart) chakra meditation with the mantra 'YAM'

- **Mindfulness meditation –** In this type of meditation focus is on being intensely aware of what you're sensing and feeling in the moment, without interpretation or judgment.
- Examples: Quick relaxation technique, Deep relaxation technique and Instant relaxation technique.

- So these Meditation does Significant decrease in the HR, systolic and diastolic BP.
- It Reduces stress and anxiety, Induces relaxation that Modulates the physiological response to stress via neurohumoral activation.
- Decreases the arterial tone and the peripheral resistance.[14]

**9) YOGA NIDRA (Yogic Sleep or Effortless Relaxation)**

- Yoga nidra is a comprehensive, profound relaxation technique for removing physical, mental, and emotional tensions.
- This practice includes awareness of different body parts, relaxation, breath awareness, auto-suggestions, and imagery.
- Yoga nidra Reduces systolic and diastolic BP , Reduces depression, anxiety, and stress[15]
- Improves quality of sleep
- Improve autonomic functions
- Influence the brain's electrical rhythms
- Duration Up to 45 min

## DISCUSSION

❖ MODE OF ACTION

### 1) EFFECT ON STRRSS

- Mental stress and sympathetic overactivity contribute to the development of systemic hypertension and cardiovascular morbidity.
- Chronic stress-induced muscular contraction reduces the lumen/diameter of blood vessels in the muscles. This can lead to increased BP.
- Yoga induces relaxation and decreases arterial tone and peripheral resistance.
- Yoga decrease sympathetic activity and enhance parasympathetic activity.
- These practices optimally balances sympatho-vagal stress response and enhance healthy cardiovascular functioning.
- As a result, emotional stability occurs, the emotional symptoms are relieved, and the systolic and diastolic BP are reduced.

### 2) IMPROVED BARORECEPTOR SENSITIVITY

- Baroreceptors are sensors located in the carotid and in the aortic arch, They sense the blood pressure and convey the information to the brain, so that a proper blood pressure can be maintained.

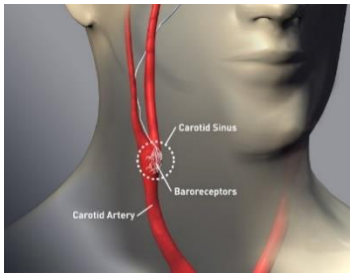


**Fig:19**

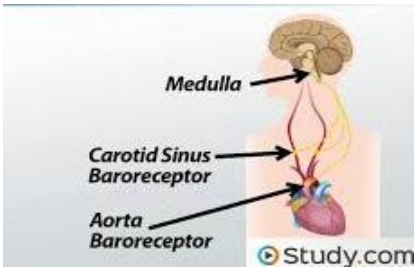


**Fig:20**

- Yogic practices reduces chemoreceptor response and improve baroreceptor sensitivity, which restores BP to normal in patients with essential hypertension.
- Improvement in baroreflex sensitivity results in the normalizing of autonomic cardiovascular rhythms
- Baroreceptor sensitivity can be enhanced significantly by slow breathing practices of yoga.

### 3) BENEFICIAL EFFECT ON SARCOPENIA

- Sarcopenia, the age-related loss of muscle mass and muscle function, is associated with hypertension in older adults.


**Fig-21.**

- Sarcopenia may contribute to the development or worsening of hypertension, because the Muscle tissue is metabolically active, and loss of muscle mass can lead to metabolic changes that may affect blood pressure regulation.
- Holding yoga postures for a few seconds builds strength by using body weight for resistance, which in turn slows the onset of sarcopenia.
- It may reduce hypertension is through the maintenance of muscle mass and function

### 4) EFFECT ON HORMONE SECRETIONS

- Some yoga postures exert controlled pressure on the kidneys and the adrenals, regulating blood supply to them, which mainly regulates BP through secretions of hormones like renin, angiotensin, adrenalin, etc.

  Improvement in sleep quality
- Studies have shown an association between insomnia and elevated BP of stage 1 and 2 hypertension.
- Yoga practices such as Om chanting and yoga nidra are beneficial in improving the sleep quality of chronic insomnia patients.

### 5) LOWERING BASAL METABOLIC RATE (B. M. R.)

- Individuals with HTN has increased sympathetic nervous system activity, it may potentially lead to a higher BMR.

- Additionally, some medications used to treat HTN, like beta-blockers, can paradoxically increase metabolic rate as a side effect.
- So Yoga can activate the parasympathetic nervous system (often called the "rest and digest" system) and opposes the sympathetic nervous system (responsible for the body's "fight or flight" response). This shift can lead to decreased heart rate and blood pressure, which may lower the BMR over time.

6) Increasing Micro-circulation and Cerebral and Cardiac circulation
7) Increasing The Cardiovascular efficiency.

## ❖ PRECAUTIONS AND CONTRAINDICATIONS

### 1) PRECAUTION FOR SHAT KRIYA

- Shankhaprakshalana (Alimentary tract cleansing) it involves repeating rounds of drinking salt water, performing a set of asanas, and evacuating the bowels.

This kriya can be risky for individuals with hypertension because water intake may lead to a rise in blood volume and thus increase in cardiac output.[16]

- ➢ Agnisara Kriya (Activating the digestive fire)
- ➢ Vamana dhauti (Regurgitative cleansing)
- ➢ Vastra dhauti (Cloth cleansing)
- ➢ Nauli kriya (Abdominal massaging)
- ➢ Basti kriya (Yogic enema)
- ➢ Kapalbhati increases diastolic BP suggesting sympathetic stimulation.[17]


**Fig:22**


**Fig:23**

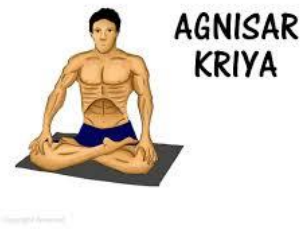


**Fig:24**

### 2) PRECAUTION FOR ASANAS

Inversions and head below the heart postures such as,

- ➢ Shirshasana (Headstand pose)
- ➢ Sarvangasana
- ➢ Chakrasana

- Halasana
- Adhomukha shvanasana
- Prasarit Padottanasana (Wide-Legged standing forward bend) Other asanas,
- Mayurasana (peacock pose);
- Dhanurasana (bow pose)

- So these asanas are Contraindicated in hypertension.[18]



**Fig:24** **Fig:25** **Fig:26** **Fig-27**

- These asanas can Cause Compression in front of the diaphragm
- So it leads to **Increase in the Intra-thoracic pressure** and **strain the cardiovascular system**, so the Pooling of the blood occurs in the head and neck region.
- Pumping against gravity increases the cardiovascular strain, resulting in raise both the systolic and diastolic arterial pressure resulting in increased BP.
- Overstraining and excess muscular efforts stimulate the sympathetic nervous system, resulting in increased BP. Therefore, it is advised to refrain from the stronger forms of practices and holding static postures for long periods.
- During yoga practice, if the breath is rapid, and the person feels agitated, flushed, dizzy, it is advised to come out of the pose and rest in shavasana.
- Relaxation in shavasana at the end of asana practice is beneficial.
- Aggressive and sudden changes in yoga postures such as standing up quickly from a lying down position should be avoided.
- Care should be taken while practicing backbends, especially in a standing position. Breath should not be held during a yoga posture.

- **Support and modification -** Supported and modified stretching using blankets, bolsters, or a chair for support is also recommended.
- For example, in Balasana (child's pose), or Adho mukha shvanasana (downward facing dog pose), the head can be supported with folded blankets or pillows, so that it is at the level of the heart.

- In viparita karni (yoga inversion pose) Legs should be supported with chair , this can give inversion benefits of lymphatic drainage and improves the venous return from the lower extremities without adding the risk of increased BP.

**Fig:28**

**Fig:29**

**Fig:30**

### 3) PRECAUTION FOR PRANAYAMA

- Fast breathing / Rapid breathing practices are unsafe in patients with hypertension and cardiovascular disease
- The ratio of the inhalation and exhalation should not be forced.
- Hyperventilation practices such as fast-paced bhastrika pranayama (bellows breath) may be unsafe in patients with hypertension and cardiovascular disease, as they cause vasoconstriction and increase BP.[19]
- Suryabhedana pranayama (right nostril breathing) has a sympathetic stimulating effect and should be avoided.[19]
- Practicing Kumbhaka (breath retention) during pranayama can result in a significant increase in systolic, diastolic, and mean arterial pressure.[20]
- It may be due to the combined effect of an increased level of heart rate and total peripheral resistance.
- So these pranayama are contraindicated in hypertension, heart disease, and individuals recovering from an illness, surgery, or injury.[18]

### 4) PRECAUTION FOR BANDA

- **Mula Bandha** (Root lock, pulling the perineum inward)
- **Uddiyan Bandha** (Abdominal lock, lifting of the diaphragm)
- **Jalandhara Bandha** (Chin Lock, pressing the chin on the chest and contracting the throat)

**Fig:31** **Fig:32** **Fig:33**

- These practices of bandha with long retention of breath, consist of neuro-muscular locks and it involve changes in internal pressure to a very high degree.
- So it Redirect the flow of blood and lymph to other parts of the body, which can strains the heart and is not recommended for hypertension.[21]
- Bandha practices during pranayama should also be avoided.

**5) YOGA CHART FOR HYPERTENSION**

**Fig-34**

❖ **CONCLUSION**

- Yoga is an effective, time-honored, and promising approach to the management of hypertension. It is a safe intervention if practiced according to prescribed safety guidelines.
- Yoga practices influence various somatic and psychological functions and help to bring a state of physiological and psychological balance.
- This helps in reduction in BP in hypertension with a reduction in the dose of antihypertensive drugs required.
- Standardized yoga therapy protocols for specific conditions are a debatable topic.

- Because the duration of recommended practices, the techniques, and in some cases, even the names of yoga practices differ with different schools of yoga.
- A uniform set of practices cannot be recommended to every patient, as it requires a customized, tailor-made approach.
- Yoga therapy is not just about performing yoga, but also about the cultivation of the right values and attitudes towards day-to-day stressors. So Yoga needs to be incorporated as a way of living a yogic lifestyle.

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