National Board of Examinations - Journal of Medical Sciences
Volume 4, Issue 4, Pages 503–511, April 2026
DOI 10.61770/NBEJMS.2026.v04.i04.007

ORIGINAL ARTICLE

Mindful Yoga Intervention for Management of Systemic Hypertension

Angusubalakshmi R,[1,*] V Sivachandiran,[2] Shiny Chrism Queen Nesan G,[3] G. Subash Chandrabose[1] and Gopika Udayakumar[4]

[1]*Assistant Professor Dept of Community Medicine, Aarupadai Veedu Medical College and Hospital, Vinayaka Mission's Research Foundation (Deemed to Be University), Kirumampakkam, Puducherry, India*
[2]*Associate Professor, Department of Community Medicine, Government Villupuram Medical College, Villupuram, Tamil Nadu, India*
[3]*Associate Professor, Department of Community Medicine, Shri Sathya Sai Medical College & Research Institute (SSSMCRI), Sri Balaji Vidyapeeth University, Kancheepuram, Tamilnadu, India*
[4]*Dept of Community Medicine, Saveetha Medical College, Thandalam, Chennai, Tamilnadu, India*

Accepted: 07-March-2026 / Published Online: 3-April-2026

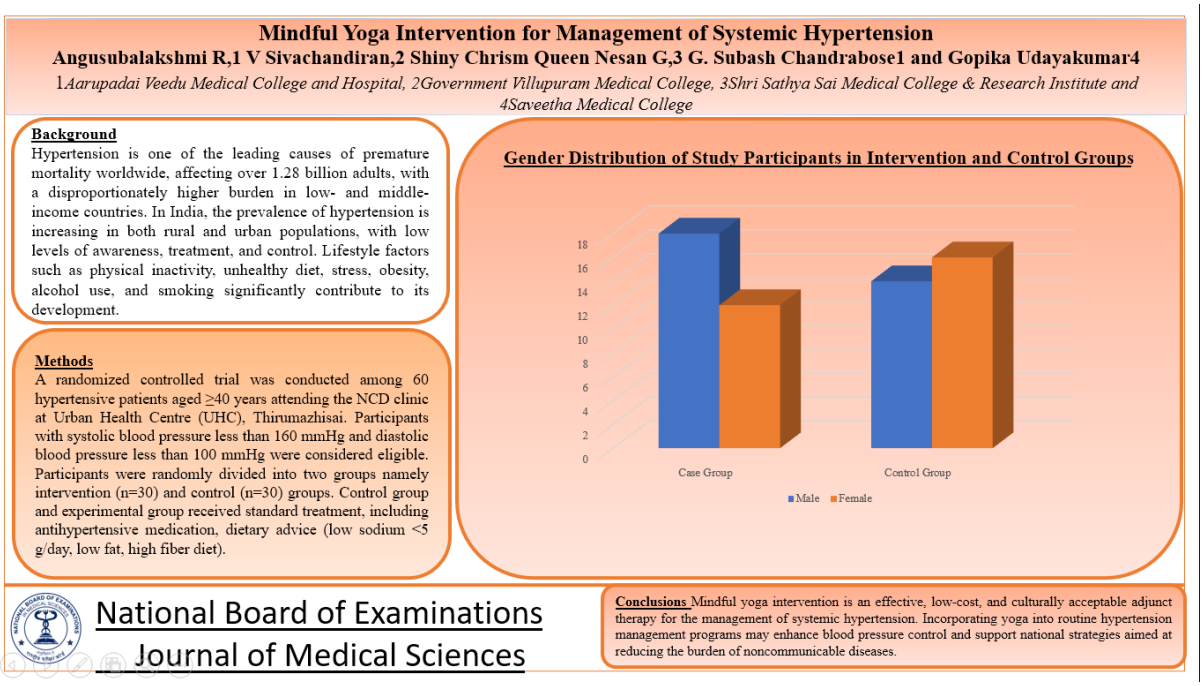
Abstract

Background: Hypertension is one of the leading causes of premature mortality worldwide, affecting over 1.28 billion adults, with a disproportionately higher burden in low- and middle-income countries. In India, the prevalence of hypertension is increasing in both rural and urban populations, with low levels of awareness, treatment, and control. Lifestyle factors such as physical inactivity, unhealthy diet, stress, obesity, alcohol use, and smoking significantly contribute to its development. **Objective:** To evaluate the effectiveness of mindful yoga intervention as an adjunct to standard treatment in reducing blood pressure and perceived stress among individuals with prehypertension and stage I hypertension. **Methods:** A randomized controlled trial was conducted among 60 hypertensive patients aged ≥40 years attending the NCD clinic at Urban Health Centre (UHC), Thirumazhisai. Participants with systolic blood pressure less than 160 mmHg and diastolic blood pressure less than 100 mmHg were considered eligible. Participants were randomly divided into two groups namely intervention (n=30) and control (n=30) groups. Control group and experimental group received standard treatment, including antihypertensive medication, dietary advice (low sodium <5 g/day, low fat, high fiber diet). **Results:** After the two month intervention period, it was found that intervention group had significant reduction in blood pressure levels when compared with the control group. A notable reduction in perceived stress scores was seen in intervention group. The findings suggest that mindful yoga, when practiced regularly alongside standard treatment, contributes to improved blood pressure control and stress reduction. **Conclusion:** Mindful yoga intervention is an effective, low-cost, and culturally acceptable adjunct therapy for the management of systemic hypertension. Incorporating yoga into routine hypertension management programs may enhance blood pressure control and support national strategies aimed at reducing the burden of noncommunicable diseases.

Keywords: Hypertension, Yoga, Mindfulness, Blood Pressure, Lifestyle Modification, Stress Management, Noncommunicable Diseases

*Corresponding Author: Angusubalakshmi R
Email: subasivachalam93@gmail.com

Graphical Abstract



Introduction

In the global context, hypertension affects 1.28 billion adults in the age group of 30–79 years, with nearly two-thirds of the affected individuals living in Low- and Middle-Income Countries. A substantial proportion of individuals remain undiagnosed, as 46% of people with hypertension are unaware of their condition. Among those affected, less than half receive appropriate treatment, and only about one-fifth achieve adequate blood pressure control. These figures highlight the significant global burden of hypertension and the gaps that continue to exist in awareness, treatment, and control. [1]. Hypertension is one of the leading causes of premature death worldwide [2]. One of the global objectives for noncommunicable illnesses is to reduce the prevalence of hypertension by 33% between 2010 and 2030 [3].

Hypertension affects about 25% of Indians who live in rural regions and 33% of those who live in cities [4,5]. Of these, 42% in cities and 25% in rural regions know they have high blood pressure. In rural areas, just 25% of Indians receive treatment for hypertension, compared to 38% in metropolitan areas. One-fifth of Indians with hypertension live in cities, whereas 10% of those with controlled blood pressure live in rural regions [6].

Hypertension has become a lifestyle disorder as a result of the population's aging and increased exposure to lifestyle risk factors, such as obesity, an unhealthy diet high in salt and saturated fat and low in fruits, vegetables, and dairy products, physical inactivity, stress, hazardous alcohol use, and smoking [7]. The prevalence of hypertension is increasing globally, making it imperative to address these lifestyle factors. However, there are regional differences in the prevalence of hypertension.

Over the past two decades, prevalence of hypertension has decreased

in High-Income Countries (HICs) whereas it has increased in many Low- and Middle-Income Countries (LMICs). This highlights the difference in global trends. These variations in the prevalence of hypertension suggest that health systems in low- and middle-income countries are facing a growing burden in non-communicable diseases while still managing load of communicable diseases [2].

Yoga is a long-standing Indian practice that is likely to lower blood pressure and assist in reducing stress [8]. In the age of evidence-based medicine, producing data to back up this assertion is crucial. In order to determine the efficacy of yoga intervention in prehypertensive and hypertensive individuals, an experiment was carried out. The trial's main goal was to evaluate scheduled yoga intervention with regular treatment in addition to the conventional intervention, which is the usual treatment guideline. Reductions in blood pressure readings and perceived stress scores were the outcome variables. Studying the sociodemographic profile and risk variables, particularly with regard to stress, were the secondary goals.

Methodology

The NCD clinic at UHC Thirumazhisai's outpatient department (OPD) for hypertension patients was the source of the target group. The standard deviation of hypertension patients' systolic blood pressure (SBP) was used to generate the sample size, which had an 80% power of study and a 5% significance level. Following the intervention, a 5 mm Hg drop in SBP was anticipated. There were sixty people in the sample. The experiment recruited individuals who were 40 years of age or older, male or female, and had blood pressure that was less than 160 systolic and less than 100 diastolic, regardless of treatment status. Blood pressure measurements were recorded by trained nursing staff at the NCD clinic following standard measurement protocols. Blood pressure was measured using a validated automated digital sphygmomanometer, with participants in a seated position after at least five minutes of rest. Patients with severe complications, stage-II and malignant hypertension, and pregnant women were not included.

Participants were randomly allocated into two groups, with 30 participants each in the intervention and control groups. Both groups received standard care, including advice on regular brisk walking with mild stretching for 30 minutes per day, dietary counselling emphasizing low sodium intake (<5 g/day) and a high-protein, high-fiber diet, routine antihypertensive medication, and counselling for smoking and alcohol cessation [9]. Intervention group had similar advice with additional weekly 5 days for 20 mins yoga sessions conducted by a certified yoga instructor over a period of 2 months. The intervention included pharmaceutical therapy: Both groups of study participants were taking antihypertensive medication as directed by a licensed doctor.

Dietary advice was given to both groups. It included suggestions for a healthy diet, such as eating three to four small meals a day, sticking to a diet low in fat and sugar, and reducing salt intake to less than 5 g (one teaspoon) per day. Other food items to be avoided included fried foods, pickles, sauces, papad, packaged foods, and sprouts. We took into account the participants' eating habits, food items' availability, feasibility, and cultural acceptability. Another recommendation

was to cut back on alcohol intake and quit smoking.

Physical exercise advice: The study participants were told to take a brisk walk (i.e., walk at a rate that permits them to cover 100 steps in a minute) in the nearby garden for thirty minutes every day at any convenient time. They should ideally do this in the morning or at night. People who can't walk for more than thirty minutes should start out slowly and increase their level of activity gradually. Participants were advised to walk at least five days a week. The yoga intervention package consisted of a set of asanas, pranayama and meditation. Intervention module was designed as per the guidelines of Ministry of AYUSH, Government of India.

The 25-year-experienced yoga trainer who designed the yoga programme was also involved in the process. Experts in the department with training as yoga teachers validated the final yoga plan. Asanas (Ardha-halasana, Ardha-pavanmuktasana, Bhujangasana, Makarasana, Paschimattanasana, Vakrasana, Parvatasana, Chakrasana) were performed at the beginning of the yoga session. Each yoga session lasted approximately 20 minutes and consisted of a structured sequence of yoga asanas (10–12 minutes), followed by pranayama (3–4 minutes), shavasana (2–3 minutes), and meditation (2–3 minutes). The sessions were conducted five days per week for a duration of two months under the guidance of a certified yoga instructor.

Participants were deemed compliant with the intervention if they practiced yoga at home, followed dietary recommendations, and engaged in physical activity for at least five days per week or more than twenty days per month. Every participant had a monthly follow-up. Reminder calls were made repeatedly to stay in contact with the participants and to support their continued follow-up. All participants completed the two-month follow-up period and no dropouts were recorded during the intervention period, largely due to regular reminder calls and continuous engagement with participants.

Data were entered into Microsoft Excel and then analyzed using IBM SPSS software version 22. A Chi-square test for categorical categories was used to compare the baseline characteristics of participants between two groups. Variables between the intervention and control groups were examined using the Mann-Whitney U test and the independent sample t-test. The Wilcoxon signed-rank test and the paired t-test were used to compare variables within each group (Figure 1 and Tables 1 and 2).

Results

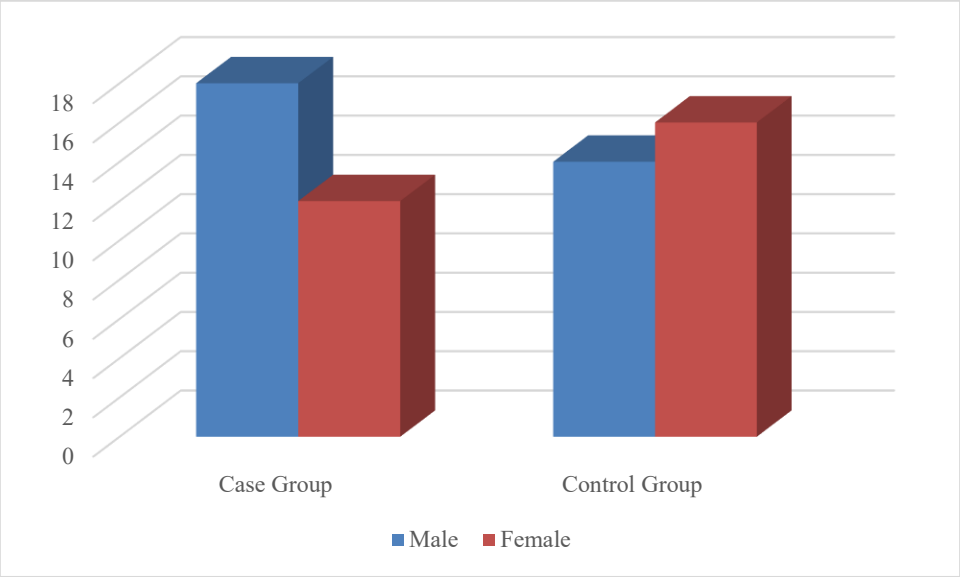


Figure 1. Gender Distribution of Study Participants in Intervention and Control Groups

Table 1. Outcome Variables Before and After Intervention

Outcome Variable	Before Intervention Case Group	Before Intervention Control Group	After Intervention Case Group	After Intervention Control Group
Mean Weight (kg)	66.9 ± 11.9	66.7 ± 10.7	64.4 ± 11.4	65.7 ± 10.4
Mean BMI (kg/m²)	26.7 ± 4.2	27.2 ± 4.0	25.7 ± 4.1	26.7 ± 3.9
Mean SBP (mm Hg)	132.3 ± 6.6	133.5 ± 5.9	125.3 ± 6.1	129.7 ± 4.9
Mean DBP (mm Hg)	86.1 ± 5.2	85.6 ± 5.3	80.8 ± 3.5	83.1 ± 3.9

Table 2. Statistical Analysis of Outcome Variables

Outcome Variable	Intervention Group Mean Difference	Control Group Mean Difference	Between Group Difference	P Value
Weight (kg)	2.5	1.0	1.5	<0.001
BMI (kg/m²)	1.0	0.5	0.5	<0.001

SBP (mmHg)	7.0	3.8	3.2	<0.001
DBP (mmHg)	5.3	2.4	2.9	<0.001

Participants' sociodemographic characteristics and hypertension risk factors were similar in both the groups. Because the intervention sessions were conducted on weekdays, it was easier for women to attend than men who were engaged in work, resulting in a higher participation of women. Of the participants, 82.8% followed a varied diet, while 17.2% were vegetarians. Every participant consumed legumes and cereal grains as part of their daily diet. While it was shown that fewer people consumed unhealthy food, such as fast food, deep-fried food, and food with added salt, just 14% of people reported eating more fruits and vegetables. Using paired t-tests and Wilcoxon signed-rank tests, significant reductions were observed in mean weight, BMI, systolic blood pressure, and diastolic blood pressure within both the intervention and control groups ($P < 0.001$).

In the intervention arm, mean diastolic blood pressure (DBP) decreased by 5.3 mmHg and mean systolic blood pressure (SBP) decreased by 7 mmHg. In the control arm, there was a 3.8 mmHg drop in mean SBP and a 2.4 mmHg drop in mean DBP. Blood pressure has decreased statistically significantly as a result of both modalities. The greater reduction observed in the intervention arm may be attributed to the yoga intervention. Despite the fact that both groups' mean weight and BMI decreased during the intervention, there was no statistically significant difference between the intervention and control groups.

Discussion

In order to effectively manage hypertension and control blood pressure, lifestyle changes must be made in addition to medical intervention. The incidence of cardiovascular problems could be significantly decreased with a simple 2 or 3 mmHg drop in the population's average blood pressure. A 5 mmHg drop in SBP in the population is predicted to lead to a 14% overall decrease in stroke mortality and a 9% decrease in coronary heart disease mortality. Therefore, any population-based technique that decreases blood pressure in the general population, even marginally, can reduce morbidity and death or delay the onset of hypertension. According to a review, practicing the three fundamental components of yoga—postures, meditation, and breathing—may have a slight but noteworthy impact on lowering blood pressure [10].

However, it is challenging to suggest a particular style of yoga due to the diversity of yoga practice and the lack of data regarding its long-term effects. Current hypertension management guidelines emphasize the importance of lifestyle modification along with pharmacological therapy for effective blood pressure control [11,12]. Earlier studies evaluating yoga and relaxation techniques have also reported reductions in blood pressure among hypertensive individuals [13–16].

This study demonstrated the beneficial effects of yoga on lowering hypertensive people's blood pressure. Following yoga practice, there was a

significant decrease in systolic blood pressure (SBP), diastolic blood pressure (DBP), and BMI. Cardiovascular diseases remain a leading cause of morbidity and mortality in India and lifestyle interventions play an important role in their prevention and management [17].

Integrating yoga-based interventions into routine hypertension management programs in public health settings may face several challenges, including limited availability of trained instructors, time constraints in busy NCD clinics, patient adherence issues, and infrastructural limitations. However, these challenges can be addressed through training healthcare workers in basic yoga guidance, conducting group-based sessions, and integrating such lifestyle interventions within existing national programs such as the NPCDCS [18].

As expressed by some participants, "Isn't it easier to take a pill rather than engage in physical activities such as yoga?", indicating a lack of motivation toward behavioral change. Mind–body interventions including yoga have also been reported to improve metabolic and psychosocial health outcomes in different populations [19]. Therefore, in order for society to embrace a healthy lifestyle that includes physical activities like yoga as a cultural practice, a high degree of motivation and a significant behavioural shift in communication are necessary. Systematic reviews have further supported the role of yoga as an adjunct therapy in the management of hypertension [20].

The present study had certain limitations. The relatively small sample size and short duration of follow-up may limit the generalizability of the findings to the wider hypertensive population. Future studies with larger sample sizes, multicentric settings, and longer follow-up periods are required to establish the long-term effectiveness and scalability of yoga-based interventions in hypertension management.

Conclusion

Patients with hypertension were able to receive a systematic intervention because of this trial. Basic techniques like yoga ought to be freely accessible to the whole public. Yoga is increasingly being incorporated into integrative healthcare settings. More health care providers offering counseling sessions could enhance adherence. Even if this will increase the cost of healthcare, the resources needed to make yoga a way of life for people are worthwhile. Yoga ought to become ingrained in society for the purpose of influencing and encouraging young people to lead healthy lifestyles from an early age. Integrated lifestyle interventions will play an important role in the future management of non-communicable diseases. A holistic health unit is required to manage non-communicable diseases (NCDs) such as obesity, hypertension, and diabetes mellitus using an integrated approach. Larger-scale trials are needed to confirm the effectiveness of non-pharmacological therapies in the management of hypertension.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

Funding

No funding was received for conducting this study.

References

1. World Health Organization. Hypertension. Geneva: World Health Organization; 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension
2. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. Nat Rev Nephrol. 2020;16(4):223–237.
3. World Health Organization. Global action plan for the prevention and control of noncommunicable diseases 2013–2020. Geneva: World Health Organization; 2013.
4. Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. J Hypertens. 2014;32(6):1170–1177.
5. Hadaye RS, Manapurath RM, Gadapani BP. Prevalence of hypertension and associated risk factors in India: a systematic review. Indian J Community Med. 2021;46(3):385–392.
6. Kaur P, Kunwar A, Sharma M, et al. India Hypertension Control Initiative—hypertension treatment and blood pressure control in a cohort in 24 sentinel site clinics. J Clin Hypertens. 2021;23(4):720–729.
7. Prabhakaran D, Jeemon P, Roy A. Cardiovascular diseases in India. Circulation. 2016;133(16):1605–1620.
8. Cramer H, Haller H, Lauche R, Dobos G. A systematic review and meta-analysis of yoga for hypertension. Am J Hypertens. 2014;27(9):1146–1151.
9. Saptharishi LG, Soudarssanane MB, Thiruselvakumar D, Sahai A, Karthigeyan M, Shankar V, et al. Community-based randomized controlled trial of non-pharmacological interventions in prevention and control of hypertension. Indian J Community Med. 2009;34(4):329–334.
10. Hagins M, States R, Selfe T, Innes K. Effectiveness of yoga for hypertension: systematic review and meta-analysis. Evid Based Complement Alternat Med. 2013;2013:649836.
11. Brook RD, Appel LJ, Rubenfire M, Ogedegbe G, Bisognano JD, Elliott WJ, et al. Beyond medications and diet: alternative approaches to lowering blood pressure. Hypertension. 2013;61(6):1360–1383.
12. Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, et al. 2017 ACC/AHA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. Hypertension. 2018;71(6):e13–e115.
13. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. JAMA. 2003;289(19):2560–2572.
14. Patel C, Marmot MG, Terry DJ. Controlled trial of yoga and biofeedback in hypertension. Lancet. 1975;2(7925):93–95.
15. 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(2):205–213.
16. Cohen DL, Bloedon LT, Rothman RL, Farrar JT, Galantino ML, Volger S, et al. Iyengar yoga versus enhanced usual care on blood pressure. Evid Based Complement Alternat Med. 2011;2011:546428.
17. Murugesan R, Govindarajulu N, Bera TK. Effect of selected yogic practices on hypertension. Indian J Physiol Pharmacol. 2000;44(2):207–210.
18. Ministry of Health and Family Welfare. National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS). New Delhi: Government of India; 2010.
19. Innes KE, Selfe TK, Taylor AG. Menopause, the metabolic syndrome, and mind–body therapies. Menopause. 2008;15(5):1005–1013.
20. Tyagi A, Cohen M. Yoga and hypertension: a systematic review. Altern Ther Health Med. 2014;20(2):32–59.