ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 10 | October - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EFFECTIVENESS OF AEROBIC, RESISTANCE AND YOGA EXERCISE IN HYPERTENSIVE PATIENTS.

Physiology

Sonika A Agarwal Assistant Professor, Department of Physiology, Zydus Medical College and Hospital, Dahod, Gujarat.

Dr. Deepak Kumar Agrawal Assistant Professor, Department of Orthopaedics, Adesh Medical College and Hospital, Village-Shahbad (Distt.Ambala), Haryana.

Dr. Babita Bansal* Assistant Professor, Department of Physiology, Gian Sagar Medical College and Hospital, Ramnagar, Rajpura. *Corresponding Author

ABSTRACT

Introduction: Hypertension, or high blood pressure (BP), is defined as persistent systolic and/or diastolic BP equal to or above 140/90 mmHg. The worldwide prevalence of hypertension among adults (>25 years) was around 40% in 2008, with a slightly lower prevalence in high-income countries. Yoga is a mind-body practice in complementary and alternative medicine with origins in ancient Indian philosophy. The early yoga (1800 BC to about 200 AD) was primarily a technique to keep the mind focused while performing different rituals. Later on, the physical body came into focus in the ritual exercise. **Material And Method:** It is a prospective, cross-sectional and descriptive study. This study was conducted in the Department of Physiology, Index Medical College over a period of 3 years. Experimental study design was carried out with a sample of 180 participants. Participants were randomly allocated using sealed envelope method to receive either aerobic training or resistance training or Yoga. Informed consent was taken from all the participants included in the study. **Results:** Yoga group Mean Systolic Blood Pressure of pre-test 136.79 ± 6.76 mmHg (Mean±SD) is reduced to Post-test 129.65 ± 6.65mm of Hg (Mean±SD). In Aerobic group Mean Systolic Blood Pressure in pre-test 135.65 ± 6.35 mm of Hg and post-test 133.65 ± 6.12. However, the difference in Systolic Blood Pressure in Yoga Group is statistically significant. (P value < 0.05). Pre-test Yoga group Mean Diastolic Blood Pressure 90.24 ± 5.65 mmHg (Mean±SD) is reduced to Post-test 83.63 ± 5.12 mm of Hg. In Aerobic group Mean Diastolic Blood Pressure in pre-test 91.63 ± 5.83 mm of Hg and post-test 87.73 ± 5.33. However, the difference in Diastolic Blood Pressure in Yoga Group is statistically significant. (P value < 0.05). **Conclusion:** There was complete awareness of hypertension, but a lesser amount of awareness of the role of aerobic exercise and yoga in hypertension. In comparison to yoga, huge numbers of patients were aware of the role of aerobic exercise in hypertension, but only few practiced them. However, there was less awareness of the role of yoga in hypertension and even lesser number of patients practiced them.

KEYWORDS

Hypertension, Yoga, Aerobic, Resistance

INTRODUCTION

Hypertension, or high blood pressure (BP), is defined as persistent systolic and/or diastolic BP equal to or above 140/90 mmHg. The worldwide prevalence of hypertension among adults (>25 years) was around 40% in 2008, with a slightly lower prevalence in high-income countries. In Sweden, approximately 2 million adults have hypertension and high BP is the most prevalent reason for visits to primary care[1].

Hypertension is important not only because of its high prevalence, but also because it is the largest single modifiable risk factor for cardiovascular disease and mortality worldwide. Furthermore, the direct and indirect costs for treatment of hypertension and its consequences constitute a substantial economic burden for our communities [2]. The beneficial effects of lowering BP on morbidity and mortality are very well documented. A decrease in systolic BP (SBP) by 10 mmHg or diastolic BP (DBP) by 5 mmHg reduces coronary heart disease (CHD) events (fatal or nonfatal) by about a quarter, stroke by about a third and heart failure by about a quarter[3].

According to WHO (2009), deaths as a result to non communicable diseases as hypertension will increase by 17% over the next decade, with the greatest increase in the African region (27%). However, primary prevention has been proposed as the 13 most cost effective approach to the emerging epidemic[4]. In 2003, a cross-sectional study by High prevalence in women (29.5%) compared to male (27.6%) and low level of awareness. However, focus has been on communicable diseases in developing countries until recently as that similar study conducted in 2006 still showed a high prevalence with 32.3% of participants not having knowledge of the disease[5].

Thus, the degree to which yoga may decrease blood pressure as well as the potential modifying effects of type of yoga intervention and type of comparison group remain unclear. To address these gaps, this research work presents a controlled study examining the effects of yoga practice on systolic and diastolic blood pressure in individuals with hypertension[6].

Yoga is a mind-body practice in complementary and alternative medicine with origins in ancient Indian philosophy. The early yoga (1800 BC to about 200 AD) was primarily a technique to keep the mind focused while performing different rituals. Later on, the physical body came into focus in the ritual exercise[7]. The word yoga comes from the Sanskrit word yuj, which means yoke or union – union between the mind and the body. Yoga aims literally to take on the yoke, to make the effort and discipline oneself, to achieve self-awareness through the complete balance between body, mind and soul[8].

Yoga further improves cardiovascular efficacy and homeostatic control of the body and results in improved autonomic balance, respiratory performance, psychological profile, and overall well-being[9]. A study evaluating the effects of fifteen minutes of stretching in Hatha yoga over four weeks found a significant increase in HRV and a marked decrease in heart rate. This study determined that increased flexibility correlated with improvements of cardiac autonomic function[10].

Aerobic Exercise produces many of the same bodily sensations that often elicit anxiety reactions such as an increase in heart rate, respiration, and perspiration. It has been suggested that mild repeated stressors may be health promoting by affecting neural networks that are shaped by prior experience, resulting in 26 altered regulations in response to future stress[10]. Researchers believe that by repeated exposure to anxiety related interceptive stimuli, through exercise, may therefore eliminate the fear response. Benefits of aerobic exercise Although exercise is regarded, in most research, as a purely physiological stimulus its emotional effects depend intimately on social and other environmental cues as well as the expectations of the individual[11].

The purpose of this case controlled study was to determine the effects of yoga on BP and quality of life in patients in primary health care diagnosed with hypertension. Another aim was to investigate whether there is a difference in effect on BP and quality of life if yoga is practiced on a regular basis in a group led by a yoga instructor or if the patient practices a shorter yoga program individually at home.

MATERIAL AND METHOD

Design: It is a prospective, cross-sectional and descriptive study.
Place: This study was conducted in the Department of Physiology,

Index Medical College over a period of 3 years.

Experimental study design was carried out with a sample of 180 participants. Participants were randomly allocated using sealed envelope method to receive either aerobic training or resistance training or Yoga. Informed consent was taken from all the participants included in the study.

Subjects
The sample size was including 60 subjects each. Subjects were randomly divided into three groups. Group A having 60 subjects, Group B having 60 subjects and Group C having 60 subjects.

Inclusion Criteria-
- Either gender with age group of 30-60 years of hypertensive subjects according to JNC VIII (Systolic BP >140mmHG and Diastolic BP>90 mmHg) was included.
- The inclusive subjects should be non-alcoholic, non-smokers.

Exclusion Criteria-
- Patient with secondary hypertension,
- Left ventricular hypertrophy,
- Recent myocardial infarction,
- Three or more risk factors of CVD,
- Unstable hypertension,
- Mentally unstable or uncooperative patients.
- Patients with history of liver disease, kidney disease and Diabetes were excluded.

Intervention
Group A: Hypertension subjects treated with aerobic exercise.

Group B: Hypertension subjects treated with resistance exercise

Group C: Hypertension subjects treated with Yoga training.

Methods:
One hundred and eighty subjects clinically diagnosed as stage-1 Hypertension were selected According to inclusion and exclusion criteria and were divided conveniently into three groups; namely group A, group B and group C, consisting of 60 subject each. All groups were explained about the purpose of the study. **Informed Consent was obtained from the subjects.** A brief explanation about the treatment session was explained to both Group-A (Aerobic exercise), Group-B (resistance exercise group) and Group-C (Yoga exercise group).

RESULTS
A total of 180 patients who fulfilled the selection criteria during the study were enrolled. The data were analysed, and the final observations were tabulated as below.

Group A: Hypertension subjects treated with aerobic exercise.

Group B: Hypertension subjects treated with resistance exercise

Group C: Hypertension subjects treated with Yoga training.

Table 1: Distribution Of Gender

Sex	Group A n (%)	Group B n (%)	Group C n (%)	p-value
Male	32 (53.3%)	31 (51.6%)	33 (55.0%)	P>0.05
Female	28 (46.6%)	29 (48.3%)	27 (45.0%)	
Total	60 (100%)	60 (100%)	60 (100%)	

In table 1, of the 60 samples, 32 were males and 28 females, which correspond to 53.3% of male and the rest female in Group A. Group B only 31 were males and 29 females, which correspond to 51.6% of males. In Group C were 33 were males and 27 females, which correspond to 55.0% of males and 45.0% of females.

Table 2: Distribution Of The Number Of Subjects According To Age Group

Age group	Group A n (%)	Group B n (%)	Group C n (%)	p-value
30-40 years	13 (21.6%)	11 (18.3%)	12 (20.0%)	P>0.05
41-50 years	21 (35.0%)	22 (36.6%)	23 (38.3%)	
51-60 years	26 (43.3%)	27 (45.0%)	25 (41.6%)	
Total	60 (100%)	60 (100%)	60 (100%)	

In table 2, in this study, the maximum number of patients were in the age group of 51-60 years which were 43.3% (n =26) of total followed by age group 41–50 years having 35.0% (n = 21) followed by age group 30-40 years with 21.6% (n=13) in Group A.

Table 3: Comparison Of Mean Pulse Rate (beats/minute) Between Yoga Group Versus Control Group

	Yoga Group Mean ±SD	Aerobic Group Mean ±SD	Resistance exercise Group Mean ±SD	p-value
Pre-test	79.69 ± 4.23	79.43 ± 4.73	79.52 ± 4.14	>0.05
Post-test	77.24 ± 4.02	78.24 ± 4.43	76.36 ± 4.01	<0.05

S: Statistically Significant.

It is observed from Table 3 that, pre-test Yoga group Mean Pulse Rate is 79.69 ± 4.23 beats/min (Mean±SD) reduced to 77.24 ± 4.02 in post-test and Aerobic group pre-test Mean Pulse Rate of 79.43 ± 4.73 beats/min (Mean±SD) remain 78.24 ± 4.43 in post-test. The difference in Pulse Rate in yoga group is statistically significant in pre and post-tests. (P value < 0.05).

Table 4: Comparison Of Mean SBP (mmHg) Between Yoga Group Versus Control Group

	Yoga Group Mean ±SD	Aerobic Group Mean ±SD	Resistance exercise Group Mean ±SD	p-value
Pre-test	136.79 ± 6.76	135.65 ± 6.35	137.34 ± 6.36	>0.05
Post-test	129.65 ± 6.65	133.65 ± 6.12	134.65 ± 6.35	<0.05

S: Statistically Significant.

It is observed from Table 4 that, Yoga group Mean Systolic Blood Pressure of pre-test 136.79 ± 6.76 mmHg (Mean±SD) is reduced to Post-test 129.65 ± 6.65mm of Hg (Mean±SD). In Aerobic group Mean Systolic Blood Pressure in pre-test 135.65 ± 6.35 mm of Hg and post-test 133.65 ± 6.12. However, the difference in Systolic Blood Pressure in Yoga Group is statistically significant. (P value < 0.05).

Table 5: Comparison Of Mean DBP (mmHg) Between Yoga Group Versus Control Group

	Yoga Group Mean ±SD	Aerobic Group Mean ±SD	Resistance exercise Group Mean ±SD	p-value
Pre-test	90.24 ± 5.65	91.63 ± 5.83	91.52 ± 4.45	>0.05
Post-test	83.63 ± 5.12	87.73 ± 5.33	88.45 ± 4.31	<0.05

It is observed from Table 5 that, pre-test Yoga group Mean Diastolic Blood Pressure 90.24 ± 5.65 mmHg (Mean±SD) is reduced to Post-test 83.63 ± 5.12 mm of Hg. In Aerobic group Mean Diastolic Blood Pressure in pre-test 91.63 ± 5.83 mm of Hg and post-test 87.73 ± 5.33. However, the difference in Diastolic Blood Pressure in Yoga Group is statistically significant. (P value < 0.05).

Table 6: Comparison Of Mean Peripheral Vascular Resistance (mmHg/min/mL) Between Yoga Group Versus Control Group

	Yoga Group Mean ±SD	Aerobic Group Mean ±SD	Resistance exercise Group Mean ±SD	p-value
Pre-test	1447.53 ± 154.43	14431.63 ± 154.83	1444.34 ± 153.25	>0.05
Post-test	1094.64 ± 133.64	14002.54 ± 143.82	1321.53 ± 133.23	<0.05

It is observed from Table 6 that, pre-test Yoga group Mean Peripheral vascular resistance reduced from 1447.53 ± 154.43 mmHg/min/mL (Mean±SD) to Post-test 1094.64 ± 133.64 mmHg/min/mL. In Aerobic group Mean Peripheral vascular resistance in pre-test 14431.63 ± 154.83 mmHg/min/mL and post-test 14002.54 ± 143.82 mmHg/min/mL. However, the difference in Mean Peripheral vascular resistance in Yoga Group is statistically significant. (P value < 0.05).

Table 7: Comparison Of Mean Baroreflex Sensitivity Between Yoga Group Versus Control Group

	Yoga Group Mean ±SD	Aerobic Group Mean ±SD	Resistance exercise Group Mean ±SD	p-value
Pre-test	6.54 ± 0.43	6.53 ± 0.53	6.35 ± 0.43	>0.05
Post-test	9.13 ± 0.91	6.94 ± 0.73	6.24 ± 0.45	<0.05

It is observed from Table 7 that, pre-test Yoga group Mean Baroreflex sensitivity increased from 6.54 ± 0.43 (Mean±SD) to Post-test 9.13 ± 0.91. In Aerobic group Mean Baroreflex sensitivity in pre-test 6.53 ± 0.53 and post-test 6.94 ± 0.73. However, the difference in Mean Baroreflex sensitivity in Yoga Group is statistically significant. (P value < 0.05).

DISCUSSION

More important than the finding that dynamic resistance exercise may reduce resting blood pressure is the fact that this investigation did not show an increase in either resting systolic or diastolic blood pressure. Efficacy of aerobics was found in a study done by, which supports our result showing Aerobic exercise intervention significantly reduced Blood Pressure.

According to a study done by C.G. Cardoso, et al; (2010) hypotension was usually observed during waking periods, According to results of resisted exercise, the real importance regarding the role of resistance training in lowering blood pressure is whether it does so in individuals with high blood pressure[12]. It is generally believed that aerobic exercise training lowers resting blood pressure more in patients with moderate-to-severe hypertension, compared with individuals with mild hypertension[13].

Furthermore, the study portrays that large numbers of patients (63.74%) fell into pre-hypertensive category with systolic BP (120–139 mmHg). With regard to diastolic BP, majority of the patients were in the prehypertensive (80–89 mmHg – 38.01%) and stage 1 hypertensive (90–99 mmHg – 40.94%) category. The present study showed that 67.68% of the patients were aware of the role of aerobic exercise in hypertension, of which 58.29% practiced aerobic exercise. The awareness of aerobic exercise was high, which may be due to an increased recommendation by a doctor and increased awareness through social media. However, patients failed to put aerobic exercise into practice despite the awareness which due to laziness or lack of time and lack of concern about one's health. Out of aerobic exercise, there was maximum awareness and practice of walking (51.50%) followed by cycling (4.5%). The reason for maximum awareness and practice of walking could be due to cost-effectiveness and commonly advised by doctors and relatives. The nutritional and behavioral measures recommended in the management of high BP improved the patients' general health status, as they also have a beneficial effect on other cardiac risk factors frequently associated with hypertension[14].

The study revealed that awareness of the role of yoga in hypertension was 33.67%, of which 13.07% practiced pranayama and 9.50% practiced asana. Similar study depicted that there was awareness and practice of walking (90%) and yoga was only 11.9%. Awareness of yoga was comparatively low with respect to aerobic exercise because of less awareness through doctors, and majority of the patients were not aware of which asanas and pranayama are helpful in hypertension. Impaired baroreflex sensitivity has been increasingly postulated to be one of the major causative factors of essential hypertension. A short period (3 months) of regular yogic practice for 1 h/day is effective in controlling BP in such individuals[15].

Of asanas, majority of patients practiced savasana (8.50%), followed by setu bandha sarvangasana (7.50%), paschimottanasana (6.50%), balasana (5.50%), and adho mukha svanasana (3%). Majority of the patients are practicing savasana, which may be due to the reason that savasana is the easiest of all asanas. The maximum awareness of aerobic exercise and yoga comes through doctors (65.22%), followed by self (26.09%) and social (8.70%). The maximum mode of awareness of aerobic exercise and yoga through doctors could be due to regular visit and improved consciousness about health. In addition, it was found that the mean duration for practice of aerobic exercise was 32.1 min (SD – 15.02) and for yoga was 13.21 min (SD – 12.88). Another study showed that aerobic exercise for 20–30 min/day helps in reducing BP in hypertensive patients[16].

There is statistically no significant difference in efficacies of treatment A, B and C. This study led to the inference that both aerobic exercise and Resistance exercises can equally reduce Blood pressure. Hence, both exercise programs may be suggested as an important component in the management of Type-1 Hypertension. Further studies could focus on long term benefits of physical therapy in this condition.

CONCLUSION

There was complete awareness of hypertension, but a lesser amount of awareness of the role of aerobic exercise and yoga in hypertension. In comparison to yoga, huge numbers of patients were aware of the role of aerobic exercise in hypertension, but only few practiced them. However, there was less awareness of the role of yoga in hypertension and even lesser number of patients practiced them. This concern can be prevailed over by education and awareness program, seminars, or community visit, which will impart the knowledge of the role of exercises and yoga with their benefits for hypertension or health to individual.

REFERENCES

1. Ribeiro F, Alves AJ, Duarte JA, Oliveira J. Is exercise training an effective therapy targeting endothelial dysfunction and vascular wall inflammation? Int J Cardiol. 2010;141(3):214–221.
2. Ribeiro F, Ribeiro IP, Alves AJ, et al. Effects of exercise training on endothelial progenitor cells in cardiovascular disease: a systematic review. Am J Phys Med Rehabil. 2013;92(11):1020–1030.
3. Cornelissen VA, Smart NA. Exercise training for blood pressure: a systematic review and meta-analysis. J Am Heart Assoc. 2013;2(1): e004473.
4. Cornelissen V a, Buys R, Smart N a. Endurance exercise beneficially affects ambulatory blood pressure: a systematic review and metaanalysis. J Hypertens. 2013;31(4):639–648.
5. Macdonald HV, Johnson BT, Huedo-Medina TB, et al. Dynamic Resistance Training as Stand-Alone Antihypertensive Lifestyle Therapy: A Meta-Analysis. J Am Heart Assoc. 2016;5(10):e003231.
6. Pescatello LS, Franklin BA, Fagard R, et al. American College of Sports Medicine position stand. Exercise and hypertension. Med Sci Sports Exerc. 2004;36(3):533–553.
7. Corso LM, Macdonald HV, Johnson BT, et al. Is Concurrent Training Efficacious Antihypertensive Therapy? A Meta-analysis. Med Sci Sports Exerc. 2016;48(12):2398–2406.
8. Inder JD, Carlson DJ, Dieberg G, Mcfarlane JR, Hess NC, Smart NA. Isometric exercise training for blood pressure management: a systematic review and meta-analysis to optimize benefit. Hypertens Res. 2016;39(2):88–94.
9. Jin YZ, Yan S, Yuan WX. Effect of isometric handgrip training on resting blood pressure in adults: a meta-analysis of randomized controlled trials. J Sports Med Phys Fitness. 2017;57(1–2):154–160.
10. Ash GI, Taylor BA, Thompson PD, et al. The antihypertensive effects of aerobic versus isometric handgrip resistance exercise. J Hypertens. 2017;35(2):291–299.
11. Pescatello LS, Macdonald HV, Lamberti L, Johnson BT. Exercise for Hypertension: A Prescription Update Integrating Existing Recommendations with Emerging Research. Curr Hypertens Rep. 2015;17(11):87.
12. Eckel RH, Jakicic JM, Ard JD. 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: A report of the American College of cardiology/American Heart Association task force on practice guidelines. Circulation. 2014;129(25 Suppl 1):1–46.
13. Diaz KM, Booth Iii JN, Calhoun DA, et al. Healthy Lifestyle Factors and Risk of Cardiovascular Events and Mortality in Treatment-Resistant Hypertension: The Regards Study. Hypertension. 2014;64(3):465–471.
14. Dimeo F, Pagonas N, Seibert F, Arndt R, Zidek W, Westhoff TH. Aerobic exercise reduces blood pressure in resistant hypertension. Hypertension. 2012;60(3):653–658.
15. Guimarães GV, Cruz LG, Tavares AC, Dorea EL, Fernandes-Silva MM, Bocchi EA. Effects of short-term heated water-based exercise training on systemic blood pressure in patients with resistant hypertension: a pilot study. Blood Press Monit. 2013;18(6):342–345.
16. Guimaraes GV, de Barros Cruz LG, Fernandes-Silva MM, Dorea EL, Bocchi EA. Heated water-based exercise training reduces 24-hour ambulatory blood pressure levels in resistant hypertensive patients: a randomized controlled trial (HEx trial). Int J Cardiol. 2014;172(2):434–441.