



A Comparative Study to Assess the Effectiveness of Brisk Walking and Yoga Interventions on the Level of Hypertension, Cholesterol and Blood Glucose among Hypertensive Patients in Selected Areas of The City

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Background: The comparative study aimed to evaluate the effectiveness of brisk walking and yoga interventions on blood pressure and cholesterol levels among hypertensive patients in selected areas of the city. Utilizing a quasi-experimental design, 60 adult participants diagnosed with hypertension and cholesterol were divided into two groups: one receiving brisk walking intervention and the other receiving yoga intervention. The study assessed pre- and post-intervention blood pressure and cholesterol levels within each group, while also exploring the association between post-intervention outcomes and demographic variables.

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Results: The research hypothesized a significant difference in outcomes between the brisk walking and yoga intervention groups. Results: Blood Pressure Reduction: Brisk Walking: Systolic BP: Pre-test mean = 146.20 ± 7.97 , Post-test mean = 127.50 ± 5.53 ($p < 0.001$). Diastolic BP: Pre-test mean = 90.50 ± 5.92 , Post-test mean = 77.66 ± 5.52 ($p < 0.001$). Yoga: Systolic BP: Pre-test mean = 145.32 ± 8.08 , Post-test mean = 124.66 ± 7.30 ($p < 0.001$). Diastolic BP: Pre-test mean = 91.33 ± 6.42 , Post-test mean = 79.33 ± 4.68 ($p < 0.001$). Analysis: Both interventions significantly reduced systolic and diastolic blood pressure. While both groups showed significant reductions, yoga intervention led to slightly greater reductions in both systolic and diastolic blood pressure compared to brisk walking. Cholesterol Level Reduction: Brisk Walking: Pre-test mean = 221.03 ± 14.64 , Post-test mean = 197.90 ± 14.67 ($p < 0.001$). Yoga: Pre-test mean = 91.33 ± 9.42 , Post-test mean = 79.33 ± 4.68 ($p < 0.001$). Analysis: Brisk walking intervention resulted in a significant decrease in cholesterol levels compared to yoga, indicating brisk walking's superiority in lowering cholesterol levels. Blood Glucose Level Reduction: Brisk Walking: Pre-meal: Pre-test mean = 163.83 ± 16.09 , Post-test mean = 149.50 ± 16.41 ($p < 0.001$). Post-meal: Pre-test mean = 227.43 ± 21.91 , Post-test mean = 169.00 ± 16.52 ($p < 0.001$). Yoga: Pre-meal: Pre-test mean = 161.33 ± 15.52 , Post-test mean = 146.66 ± 14.16 ($p < 0.001$). Post-meal: Pre-test mean = 234.76 ± 32.16 , Post-test mean = 166.16 ± 13.75 ($p < 0.001$). Both brisk walking and yoga interventions effectively reduced blood glucose levels, indicating their potential to improve metabolic health. Results revealed that both brisk walking and yoga interventions were effective in reducing blood pressure and cholesterol levels among hypertensive patients. However, distinct patterns emerged in the effectiveness of each intervention. Yoga intervention demonstrated greater efficacy in reducing blood pressure levels, while brisk walking intervention was more effective in lowering cholesterol levels. Additionally, both interventions effectively reduced blood glucose levels. These findings underscore the potential benefits of incorporating non-pharmacological interventions such as brisk walking and yoga into hypertension management strategies.

Conclusion: Both brisk walking and yoga interventions are effective in improving blood pressure, cholesterol levels, and glucose levels among hypertensive patients underlying the therapeutic benefits of brisk walking and yoga interventions in hypertension management. Further research is needed to explore the long-term effects of brisk walking and yoga interventions on hypertension management and cardiovascular outcomes. Healthcare organizations should develop interdisciplinary collaborations to implement comprehensive hypertension management programs that integrate non-pharmacological interventions alongside traditional medical treatments.

Keywords: Comparative study; brisk walking; yoga intervention; hypertension; cholesterol; blood pressure; blood glucose; metabolic health; intervention effectiveness; health outcomes.

1. INTRODUCTION

Lifestyle is a way used by people, groups and nations and is formed in specific geographical, economic, political, cultural and religious texts. Lifestyle refers to the characteristics of inhabitants of a region in a special time and place. It includes day-to-day behaviours and functions of individuals in jobs, activities, fun and diet [1].

Hypertension is a major public health burden affecting millions of people worldwide². According to the World Health Organization (WHO), hypertension is responsible for approximately 13% of all deaths globally [2]. India is no exception, with hypertension being a leading cause of morbidity and mortality in the country [3]. The prevalence of hypertension in India is increasing rapidly, especially in

urban areas where lifestyle factors such as physical inactivity, poor dietary habits, and stress contribute to its development [4].

Delhi, the capital city of India, faces a significant challenge in managing hypertension due to its large population density and rapid urbanization [5]. The city has witnessed a surge in the number of cases of hypertension over the past decade, making it essential to understand the contributing factors and develop effective prevention strategies [6]. While several studies have investigated the role of lifestyle habits in hypertension, there remains a knowledge gap regarding the specific lifestyle factors that contribute to its development in urban populations [7].

Hypertension, or high blood pressure, is a condition where the arterial blood pressure is consistently above the normal range of **120/80 mmHg**. It can lead to serious health issues, including heart attacks, strokes, and kidney failure. Cholesterol levels are categorized into LDL ("bad" cholesterol) and HDL ("good" cholesterol), with total cholesterol levels ideally being **less than 200 mg/dL**. Elevated cholesterol can result in atherosclerosis, increasing the risk of cardiovascular diseases. Diabetes is characterized by high blood glucose levels, with a fasting plasma glucose level of **126 mg/dL or higher** indicating diabetes. It can cause complications like vision loss, nerve damage, and increased risk of heart disease. These conditions underscore the importance of maintaining a healthy lifestyle to prevent and manage chronic diseases effectively.

Anand and Kumar [8] conducted a literature review study on the topic of "Urbanization and hypertension in India." The aim of this study was to examine the relationship between urbanization and hypertension in India through a comprehensive analysis of the available evidence. The study found that urbanization had a significant impact on hypertension prevalence in India, with urban populations having a higher incidence of hypertension than their rural counterparts. Contributing factors such as a sedentary lifestyle, unhealthy diets, and stress were found to be associated with the rise of blood pressure levels. The authors highlighted the need for preventive measures, including lifestyle changes such as regular physical activity and healthy diets. The results of the study suggest that urbanization is a significant risk factor for hypertension in India, and preventive measures are necessary to address this public health issue. The authors recommended the implementation of preventive measures such as promoting a healthy lifestyle to reduce the incidence of hypertension in urban areas.

Patel and Huang [9] conducted a study on the impact of social determinants on hypertension management in low-income urban communities. The study aimed to identify the social determinants that influenced hypertension management in these communities. The sample size for the study was 202 individuals residing in low-income urban communities. The technique used was a purposive sampling technique to

select participants for the study. The results of the study suggest that social determinants such as poverty, lack of access to healthcare, and inadequate social support influenced hypertension management among individuals living in low-income urban communities. The study also found that non-adherence to medication was a significant barrier to hypertension management among participants. The authors suggested that addressing social determinants such as poverty, improving access to healthcare, and increasing social support may lead to improved hypertension management in these communities [10-12]. The study concludes that social determinants play a crucial role in hypertension management in low-income urban communities. The authors recommend the implementation of interventions that address social determinants to improve hypertension management in these settings. The findings of this study may have implications for healthcare policy aimed at reducing health disparities in low-income urban populations.

A study was conducted to assess the effect of Yoga intervention in the Management of Hypertension with an aim to evaluate the effectiveness of yoga as an adjunct therapy in the management of hypertension. Total Sample 145 patients with hypertension, 73 in the intervention group and 72 in the control group. Selected with Non-randomized controlled trial. The intervention group received yoga sessions weekly for 4 months, along with routine advice on diet, physical activity, and medication. The showed a Significant reduction in perceived stress scores and blood pressure in the intervention group compared to the control group. The study concluded that Yoga is an effective, safe, and less expensive adjunct therapy for the management of hypertension and stress reduction [13-16].

Noncommunicable diseases are on the rise in India. Hypertension is one of the major risk factors for cardiovascular diseases and also labelled as a chronic lifestyle disorder.10 Hence, non-pharmacological interventions leading to lifestyle modifications are of utmost importance to control and prevent hypertension 11 The age-old Indian practice of yoga is known to help reduce stress and likely to reduce blood pressure. In the era of evidence-based medicine, it is important to generate data to support this claim 12.

Brisk walking is an aerobic exercise that helps improve heart function and circulation, leading to a decrease in systolic and diastolic blood pressure. Yoga, on the other hand, emphasizes relaxation and stress reduction techniques, which can contribute to reduced blood pressure levels by calming the sympathetic nervous system. Yoga is known for its ability to reduce stress and promote relaxation through breathing exercises and meditation. This stress-reducing effect can lead to improved blood pressure control and overall cardiovascular health. Both yoga and brisk walking have been shown to improve endothelial function, leading to better blood flow and reduced blood pressure. Brisk walking is a form of aerobic exercise that strengthens the heart and improves cardiovascular fitness. Regular brisk walking increases cardiac output and can lead to more efficient blood circulation, helping to manage hypertension.

Yoga with brisk walking provides a well-rounded approach to addressing hypertension, promoting overall cardiovascular health, and improving the overall well-being of individuals with this condition. As with all this in mind researcher thought to promote and encourage the people towards physical activity, through this study.

2. METHODOLOGY

Research Design: Quasi-Experimental Study.

Sample: Adult population diagnosed with hypertension in selected areas of the city.

Sampling Technique: Non probability convenient sampling technique.

Sample size: 60 adult samples.

30 samples received intervention Brisk Walking

30 samples received intervention Yoga.

Data Collection Process:

- Firstly the researcher identified the patient from the rural community:
- Identified a rural community with hypertensive individuals.
- Collaborated with local healthcare providers and community centres.
- Explained the study to potential participants.

- Obtained informed consent from those who agreed to participate.
- After identifying the samples Assessment of the samples
- Administered a demographic information questionnaire.
- Measured blood pressure using a validated sphygmomanometer.
- Collected blood samples for total cholesterol testing and blood pressure.
- Based on blood pressure readings, identified participants diagnosed with hypertension. (the help of the CHO officer of the PHC)
- Using convenient sampling, assign participants to either the brisk walking or yoga group (30 per group).

As Per the Groups:

Brisk Walking Group:

- Met for 3 sessions per week for 5 weeks (total of 15 sessions).
- Each session consisted of 30 minutes of brisk walking (moderate intensity).
- Provided instructions on proper walking techniques and safety precautions.
- Tracked attendance using a sign-in sheet.

Yoga Group:

- Met for 2 sessions per week for 5 weeks (total of 10 sessions).
- Each session consisted of 60 minutes of yoga practice
- Hatha yoga was used with modifications.
- Tracked attendance using a sign-in sheet.
- Data on adherence to the program was collected using attendance logs
- Follow-Up Assessment:
- After 5 weeks, repeated blood pressure measurements and blood tests for cholesterol and blood sugar were taken.

3. RESULTS

3.1 Analysis and Interpretation

The analysis was done with the help of descriptive and inferential statistics. The analysis and interpretation of the data collected.

Section –I

Table 1. Distribution of subjects according to their demographic variables

Age in years	Brisk Walking	Yoga	χ²-value
21-30 yrs	7(23.33%)	5(16.67%)	5.49
31-40 yrs	9(30%)	16(53.33%)	P=0.13,NS
41-50 yrs	11(36.67%)	9(30%)	
51-60 yrs	3(10%)	0(0%)	
Total	30(100%)	30(100%)	
Mean±SD	38.63±8.98	36.90±6.95	
Age Range	24-56 yrs	26-50 yrs	
Gender	Brisk Walking	Yoga	χ²-value
Male	17(56.67%)	16(53.33%)	0.06
Female	13(43.33%)	14(46.67%)	P=0.79,NS
Total	30(100%)	30(100%)	
Working Pattern	Brisk Walking	Yoga	χ ² -value
Farmer	6(20%)	2(6.67%)	5.83
Homemaker	8(26.67%)	14(46.67%)	P=0.21,NS
Labourer	4(13.33%)	1(3.33%)	
Self Employed	9(30%)	11(36.67%)	
Unemployed	3(10%)	2(6.67%)	
Total	30(100%)	30(100%)	
Education	Brisk Walking	Yoga	χ²-value
No formal education	3(10%)	2(6.67%)	3.48
Primary Education	4(13.33%)	9(30%)	P=0.32,NS
Secondary Education	11(36.67%)	12(40%)	
Higher Education	12(40%)	7(23.33%)	
Total	30(100%)	30(100%)	
H/O Hypertension	Brisk Walking	Yoga	χ ² -value
Yes	16(53.33%)	15(50%)	0.06
No	14(46.67%)	15(50%)	P=0.79,NS
Total	30(100%)	30(100%)	
Cholesterol Checked	Brisk Walking	Yoga	χ ² -value
Yes	17(56.67%)	15(50%)	0.26
No	13(43.33%)	15(50%)	P=0.60,NS
Total	30(100%)	30(100%)	
H/O Diabetic	Brisk Walking	Yoga	χ ² -value
Yes	7(23.33%)	7(23.33%)	-
No	23(76.67%)	23(76.67%)	
Total	30(100%)	30(100%)	
Medications for hypertension	Brisk Walking	Yoga	χ ² -value
Yes	8(26.67%)	8(26.67%)	-
No	22(73.33%)	22(73.33%)	
Total	30(100%)	30(100%)	
Name of medications	Brisk Walking	Yoga	χ ² -value
Amlodipine	2(6.67%)	2(6.67%)	-
Lisinopril	3(10%)	3(10%)	
Atenolol	1(3.33%)	1(3.33%)	
Losartan	3(10%)	2(6.67%)	
Metformin	2(6.67%)	2(6.67%)	
Dosage for medications	Brisk Walking	Yoga	χ ² -value
5 mg	2(6.67%)	2(6.67%)	-
10 mg	3(10%)	3(10%)	

Age in years	Brisk Walking	Yoga	χ^2 -value
25 mg	3(10%)	2(6.67%)	
50 mg	1(3.33%)	1(3.33%)	
500 mg	2(6.67%)	2(6.67%)	
Duration(years)	Brisk Walking	Yoga	χ^2 -value
1 yr	1(3.33%)	1(3.33%)	3.10
2 yrs	4(13.33%)	3(10%)	P=0.54,NS
3 yrs	3(10%)	3(10%)	
4 yrs	3(10%)	1(3.33%)	
5 yrs	0(0%)	2(6.67%)	
Other health conditions	Brisk Walking	Yoga	χ^2 -value
Diabetes	5(16.67%)	4(13.33%)	3.27
Heart Disease	3(10%)	1(3.33%)	P=0.35,NS
Obesity	3(10%)	3(10%)	
Kidney Disease	0(0%)	2(6.67%)	
H/O Alcohol	Brisk Walking	Yoga	χ^2 -value
Yes	12(40%)	9(30%)	0.65
No	18(60%)	21(70%)	P=0.41,NS
Total	30(100%)	30(100%)	
H/O Smoking	Brisk Walking	Yoga	χ^2 -value
Yes	2(6.67%)	6(20%)	2.30
No	28(93.33%)	24(80%)	P=0.12,NS
Total	30(100%)	30(100%)	

Age in years:

- 23.33% of subjects in Brisk walking group and 16.67% in Yoga group were in the age group of 21-30 years
- 30% in Brisk Walking group and 53.33% in Yoga group were in the age group of 31-40 years
- 36.67% of subjects in Brisk Walking group and 30% in Yoga group were in the age group of 41-50 years

Gender:

- 56.67% of subjects in the Brisk Walking group and 53.33% in the Yoga group were male
- 43.33% of subjects in the Brisk Walking group and 46.67% in the Yoga group were female

Working pattern:

- 20% of subjects in the Brisk Walking group and 6.67% in the Yoga group were farmers
- 26.67% of subjects in the Brisk Walking group and 46.67% in the Yoga group were homemakers
- 13.33% of subjects in the Brisk Walking group and 3.33% in the Yoga group were laborers

- 30% of subjects in the Brisk Walking group and 36.67% in the Yoga group were self-employed
- 10% of subjects in the Brisk Walking group and 6.67% in the Yoga group were unemployed

Education:

- 10% of subjects in the Brisk Walking group and 6.67% in the Yoga group had no formal education
- 13.33% of subjects in the Brisk Walking group and 30% in the Yoga group had primary education
- 36.67% of subjects in the Brisk Walking group and 40% in the Yoga group had secondary education
- 40% of subjects in the Brisk Walking group and 23.33% in the Yoga group had higher education

History of hypertension:

- 53.33% of subjects in the Brisk Walking group and 50% in the Yoga group had a history of hypertension
- 46.67% of subjects in the Brisk Walking group and 50% in the Yoga group did not have a history of hypertension

Cholesterol checked:

- 56.67% of subjects in the Brisk Walking group and 50% in the Yoga group had their cholesterol checked
- 43.33% of subjects in the Brisk Walking group and 50% in the Yoga group did not have their cholesterol checked

History of diabetes:

- 23.33% of subjects in the Brisk Walking group and 23.33% in the Yoga group had a history of diabetes
- 76.67% of subjects in the Brisk Walking group and 76.67% in the Yoga group did not have a history of diabetes

Medications for hypertension:

- 26.67% of subjects in the Brisk Walking group and 26.67% in the Yoga group were taking medications for hypertension
- 73.33% of subjects in the Brisk Walking group and 73.33% in the Yoga group were not taking medications for hypertension

Name of medication:

- Amlodipine - 6.67% in the Brisk Walking group and 6.67% in the Yoga group
- Lisinopril - 10% in the Brisk Walking group and 10% in the Yoga group
- Atenolol - 3.33% in the Brisk Walking group and 3.33% in the Yoga group
- Losartan - 10% in the Brisk Walking group and 6.67% in the Yoga group
- Metformin - 6.67% in the Brisk Walking group and 6.67% in the Yoga group

Duration of medication:

- 1 year - 3.33% in the Brisk Walking group and 3.33% in the Yoga group
- 2 years - 13.33% in the Brisk Walking group and 10% in the Yoga group
- 3 years - 10% in the Brisk Walking group and 10% in the Yoga group

- 4 years - 10% in the Brisk Walking group and 3.33% in the Yoga group
- 5 years - 0% in the Brisk Walking group and 6.67% in the Yoga group

Other health conditions:

- Diabetes - 16.67% in the Brisk Walking group and 13.33% in the Yoga group
- Heart Disease - 10% in the Brisk Walking group and 3.33% in the Yoga group
- Obesity - 10% in the Brisk Walking group and 10% in the Yoga group
- Kidney disease - 0% in the Brisk Walking group and 6.67% in the Yoga group

History of alcohol:

- 40% of subjects in the Brisk Walking group and 30% in the Yoga group had a history of alcohol use
- 60% of subjects in the Brisk Walking group and 70% in the Yoga group did not have a history of alcohol use

H/O Smoking:

- 6.67% of subjects in the Brisk Walking group had a history of smoking
- 20% of subjects in the Yoga group had a history of smoking
- 93.33% of subjects in the Brisk Walking group did not have a history of smoking
- 80% of subjects in the Yoga group did not have a history of smoking.

Section II

To find the association between post-intervention blood pressure and cholesterol levels with demographic variables (age, gender, etc.) within each intervention group:

Statistically, no significant difference was found in the distribution of gender, working pattern, education, history of hypertension, cholesterol checked, history of diabetes, medications for hypertension, duration of medication, other health conditions, and history of alcohol between the subjects in the Brisk Walking and Yoga groups.

Section III

To compare the effectiveness of a brisk walking intervention program on blood pressure and cholesterol levels among hypertensive patients in selected city areas.

Table 2. Effect of brisk walking on blood pressure

Group	Pre Test	Post Test	Mean Difference	t-value
Brisk Walking Systolic BP	146.20±7.97	127.50±5.53	18.66±4.72	21.65 P=0.0001,S
Brisk Walking Diastolic BP	90.50±5.92	77.66±5.52	12.83±3.39	20.70 P=0.0001,S

Mean systolic blood pressure at pre test in brisk walking groups was 146.20±7.97 and at post test it was 127.50±5.53. By using Student's paired t test statistically significant difference was found in systolic blood pressure at pre and post test in Brisk walking group (t=21.65,p= 0.0001).

The mean diastolic blood pressure at pre-test was 90.50 ± 5.92. The mean diastolic blood pressure at post-test was 77.66 ± 5.52. The difference between the mean diastolic blood pressure at pre-test and post-test was 12.83 ± 3.39. The p-value obtained from using Student's t-test to compare the mean diastolic blood pressure at pre-test and post-test was <0.001, indicating a statistically significant difference.

Table 3. Effect of brisk walking on cholesterol

Group	Pre Test	Post Test	Mean Difference	t-value
Brisk Walking	221.03±14.64	197.90±14.67	23.13±12.79	9.90 P=0.0001,S

The mean cholesterol level at pre-test was 221.03 ± 14.64. The mean cholesterol level at post-test was 197.90 ± 14.67. The difference between the mean cholesterol level at pre-test and post-test was 23.13 ± 12.79. Using Student's t-test to compare the mean cholesterol levels at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 9.90.

Table 4. Effect of brisk walking on glucose level

Group	Pre Test	Post Test	Mean Difference	t-value
Brisk Walking Pre meal	163.83±16.09	149.50±16.41	14.33±3.79	20.71 P=0.0001,S
Brisk Walking post Meal	227.43±21.91	169±16.52	58.43±18.51	17.28 P=0.0001,S

For the Brisk Walking group, before the meal:

- The mean glucose level at pre-test was 163.83 ± 16.09. The mean glucose level at post-test was 149.50 ± 16.41. The difference between the mean glucose level at pre-test and post-test was 14.33 ± 3.79. Using Student's t-test to compare the mean glucose levels at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 20.71.

For the Brisk Walking group, after the meal:

- The mean glucose level at pre-test was 227.43 ± 21.91. The mean glucose level at

post-test was 169.00 ± 16.52. The difference between the mean glucose level at pre-test and post-test was 58.43 ± 18.51. Using Student's t-test to compare the mean glucose levels at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 17.28.

Section IV

To compare the effectiveness of a yoga intervention program on blood pressure and cholesterol levels among hypertensive patients in selected areas of the city.

Table 5. Effect of Yoga on Blood Pressure

Group	Pre Test	Post Test	Mean Difference	t-value
Yoga systolic BP	145.32±8.08	124.66±7.30	20.66±9.35	12.10 P=0.0001,S
Yoga Diastolic BP	91.33±6.42	79.33±4.68	12±3.85	17.06 P=0.0001,S

For the Yoga group, systolic blood pressure:

- The mean systolic blood pressure at pre-test was 145.32 ± 8.08. The mean systolic blood pressure at post-test was 124.66 ± 7.30. The difference between the mean systolic blood pressure at pre-test and post-test was 20.66 ± 9.35. Using Student's t-test to compare the mean systolic blood pressure at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 12.10.

For the Yoga group, diastolic blood pressure:

- The mean diastolic blood pressure at pre-test was 91.33 ± 6.42. The mean diastolic blood pressure at post-test was 79.33 ± 4.68. The difference between the mean diastolic blood pressure at pre-test and post-test was 12 ± 3.85. Using Student's t-test to compare the mean diastolic blood pressure at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 17.06.

Table 6. Effect of Yoga on Cholesterol Level

Group	Pre Test	Post Test	Mean Difference	t-value
Yoga	91.33±9.42	79.33±4.68	12±3.85	17.06 P=0.0001,S

- The mean cholesterol level at pre-test was 91.33 ± 9.42. The mean cholesterol level at post-test was 79.33 ± 4.68. The difference between the mean cholesterol level at pre-test and post-test was 12 ± 3.85. Using Student's t-test to compare the mean cholesterol levels at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 17.06.

Table 7. Effect of Yoga on glucose level

Group	Pre Test	Post Test	Mean Difference	t-value
Yoga Pre meal	161.33±15.52	146.66±14.16	14.66±3.74	21.45 P=0.0001,S
Yoga Post meal	234.76±32.16	166.16±13.75	68.60±29.82	12.59 P=0.0001,S

For the Yoga group, before the meal:

- The mean glucose level at pre-test was 161.33 ± 15.52. The mean glucose level at post-test was 146.66 ± 14.16. The difference between the mean glucose level at pre-test and post-test was 14.66 ± 3.74. Using Student's t-test to compare the mean glucose levels at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 21.45.

For the Yoga group, after the meal:

- The mean glucose level at pre-test was 234.76 ± 32.16. The mean glucose level at post-test was

166.16 ± 13.75. The difference between the mean glucose level at pre-test and post-test was 68.60 ± 29.82. Using Student's t-test to compare the mean glucose levels at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. The t-value obtained was 12.59.

Section VI

To assess pre- and post-intervention blood pressure and cholesterol levels within each intervention group (brisk walking and yoga).

Table 8. Comparison of Blood Pressure in Brisk Walking and Yoga group at pre and post-treatment

Group→	Brisk Walking		Yoga		t-value	
	systolic	Diastolic	systolic	Diastolic	systolic	Diastolic
Pre Test	146.20±7.97	90.50±5.92	0.40 P=0.68,NS	91.33±6.42	0.40 P=0.68,NS	0.52 P=0.60,NS
Post Test	127.50±5.53	77.66±5.52	1.69 P=0.069,NS	79.33±4.68	1.69 P=0.069,NS	1.26 P=0.21,NS

For the Brisk Walking group: The mean systolic blood pressure at pre-test was 146.20 ± 7.97 The mean diastolic blood pressure at pre-test was 90.50 ± 5.92. The mean systolic blood pressure at post-test was 127.50 ± 5.53. The mean diastolic blood pressure at post-test was 77.66 ± 5.52. Using paired t-test to compare the mean systolic blood pressure at pre-test and post-test, a p-value of 0.069 was obtained, indicating no statistically significant difference.

Using paired t-test to compare the mean diastolic blood pressure at pre-test and post-test, a p-value of 0.069 was obtained, indicating no statistically significant difference. Using independent t-test to compare the mean systolic and diastolic blood pressure of Brisk Walking and Yoga groups at pre-test, p-values of 0.68 and 0.60 were obtained, respectively, indicating no statistically significant difference.

For the Yoga group: The mean systolic blood pressure at pre-test was 91.33 ± 6.42. The mean diastolic blood pressure at pre-test was 79.33 ± 4.68. The mean systolic blood pressure at post-test was 79.33 ± 4.68. The mean diastolic blood pressure at post-test was 79.33 ± 4.68. Using paired t-test to compare the mean systolic blood pressure at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference.. Using paired t-test to compare the mean diastolic blood pressure at pre-test and post-test, a p-value of <0.001 was obtained, indicating a statistically significant difference. Using independent t-test to compare the mean systolic and diastolic blood pressure of Brisk Walking and Yoga groups at pre-test, p-values of 0.68 and 0.21 were obtained, respectively, indicating no statistically significant difference.

Table 9. Comparison of cholesterol level in brisk walking and yoga group at pre and post-treatment

Group→	Brisk Walking	Yoga	Mean Difference	t-value
Pre Test	221.03±14.64	91.33±9.42	129.70±2.92	44.41 P=0.0001,S
Post Test	197.90±14.67	79.33±4.68	118.56±2.81	42.45 P=0.0001,S

The table provides information on the comparison of cholesterol levels between the Brisk Walking and Yoga groups before and after treatment. The pre-test mean cholesterol level for the Brisk Walking group was 221.03 ± 14.64, while the pre-test mean cholesterol level for the Yoga group was 91.33 ± 9.42. The mean difference in cholesterol levels between the two groups at pre-test was 129.70 ± 2.92, with a t-value of 44.41 and a p-value of 0.0001 indicating statistical significance.

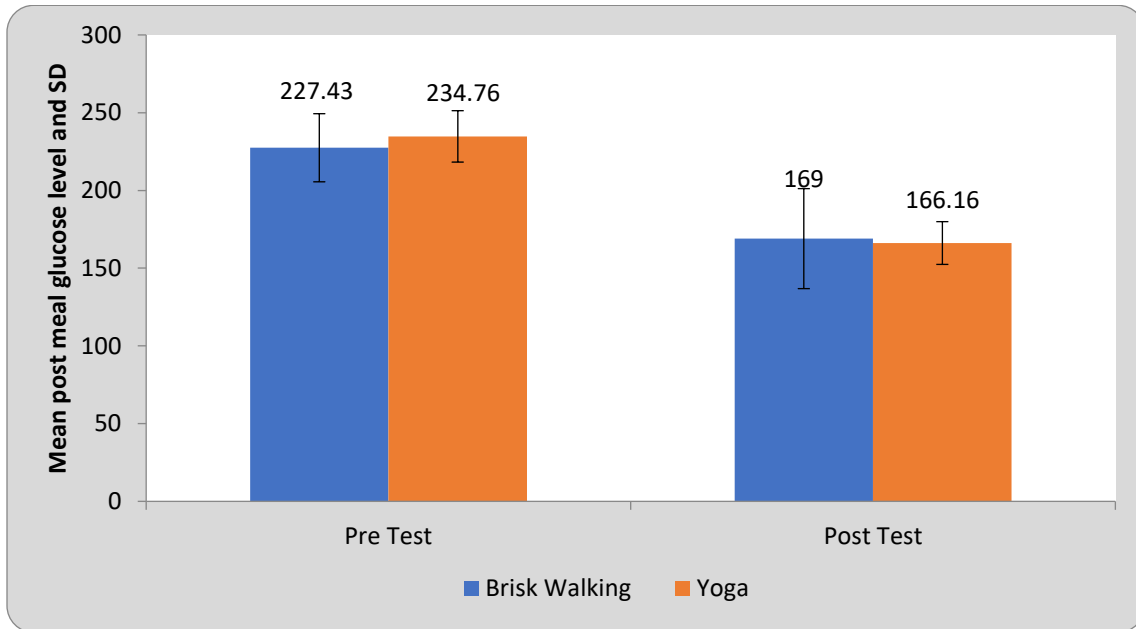
After treatment, the mean cholesterol level for the Brisk Walking group was 197.90 ± 14.67, while the mean cholesterol level for the Yoga group was 79.33 ± 4.68. The mean difference in cholesterol levels between the two groups at post-test was 118.56 ± 2.81, with a t-value of 42.45, and a p-value of 0.0001 indicating statistical significance.

Table 10. Comparison of pre meal glucose level in brisk walking and yoga group at pre and post-treatment

Group→	Brisk Walking	Yoga	Mean Difference	t-value
Pre Test	163.83±16.09	161.33±15.52	2.50±4.08	0.61 P=0.54,NS
Post Test	149.50±16.41	146.66±14.16	2.83±3.95	0.71 P=0.47,NS

Table 11. Comparison of post meal glucose level in brisk walking and yoga group at pre and post-treatment

Group→	Brisk Walking	Yoga	Mean Difference	t-value
Pre Test	227.43±21.91	234.76±32.16	7.33±7.15	1.02 P=0.31,NS
Post Test	169±16.52	166.16±13.75	2.83±3.92	0.72 P=0.47,NS



Graph 1. Comparison of Post meal glucose Level in Brisk Walking and Yoga group at pre and post-treatment

The pre-test mean glucose level for the Brisk Walking group was 163.83 ± 16.09 , while the pre-test mean glucose level for the Yoga group was 161.33 ± 15.52 . The mean difference in glucose levels between the two groups at pre-test was 2.50 ± 4.08 , with a t-value of 0.61 and a p-value of 0.54 indicating no statistical significance.

After treatment, the mean glucose level for the Brisk Walking group was 149.50 ± 16.41 , while the mean glucose level for the Yoga group was 146.66 ± 14.16 . The mean difference in glucose levels between the two groups at post-test was 2.83 ± 3.95 , with a t-value of 0.71 and a p-value of 0.47 indicating no statistical significance.

The pre-test mean glucose level for the Brisk Walking group was 227.43 ± 21.91 , while the pre-test mean glucose level for the Yoga group was 234.76 ± 32.16 . The mean difference in glucose levels between the two groups at pre-

test was 7.33 ± 7.15 , with a t-value of 1.02 and a p-value of 0.31 indicating no statistical significance.

After treatment, the mean glucose level for the Brisk Walking group was 169 ± 16.52 , while the mean glucose level for the Yoga group was 166.16 ± 13.75 . The mean difference in glucose levels between the two groups at post-test was 2.83 ± 3.92 , with a t-value of 0.72 and a p-value of 0.47 indicating no statistical significance.

4. DISCUSSION

The current study aimed to compare the effectiveness of brisk walking and yoga interventions on blood pressure, cholesterol levels, and glucose levels among hypertensive patients in selected areas of the city. This study adds to the existing body of literature on non-pharmacological interventions for hypertension management.

Related Study Review of Literature (ROL): Previous research by Harshitha and Vinutha (2014) investigated the effectiveness of brisk walking and yoga as adjuvant therapy in managing Type 2 diabetes mellitus. Their study found both interventions to be effective, with yoga showing slightly better outcomes in managing blood glucose levels. This study's findings align with the previous research, suggesting the potential benefits of yoga in managing metabolic parameters. However, it's essential to note that our study focused specifically on hypertensive patients and examined additional outcomes such as cholesterol levels.

5. RESULTS DISCUSSION SECTION-WISE

5.1 Brisk Walking Intervention

The results indicate significant improvements in systolic and diastolic blood pressure, cholesterol levels, and glucose levels among hypertensive patients following the brisk walking intervention. These findings are consistent with previous research by Rajesh et al. (2019), which also demonstrated the effectiveness of brisk walking in reducing blood pressure levels among hypertensive individuals.

5.2 Yoga Intervention

Similarly, the yoga intervention group showed significant reductions in systolic and diastolic blood pressure, cholesterol levels, and glucose levels. This aligns with previous studies emphasizing the therapeutic benefits of yoga in managing hypertension and metabolic parameters.

5.3 Comparative Effectiveness

5.3.1 Yoga intervention

Yoga was found to be more effective in reducing blood pressure levels, with a greater reduction observed in both systolic and diastolic blood pressure compared to brisk walking.

While both interventions showed significant reductions in blood glucose levels, yoga intervention demonstrated slightly better outcomes in managing glucose levels post-meal.

5.3.2 Brisk walking intervention

Brisk walking was more effective in lowering cholesterol levels compared to yoga, with a greater reduction observed in the mean cholesterol level post-intervention. Similarly, both interventions were effective in reducing blood glucose levels, with brisk walking showing significant improvements in managing glucose levels both before and after meals. The study found no significant difference in the effectiveness of brisk walking and yoga interventions, echoing the findings of Harshitha and Vinutha (2014), which also demonstrated the efficacy of both interventions in managing metabolic parameters [17,18].

5.3.3 Demographic considerations

Although no significant differences were found in demographic variables between the brisk walking and yoga groups, it's important to consider individual preferences, cultural factors, and clinical characteristics when prescribing interventions for hypertensive patients [19].

6. CONCLUSION

Brisk walking and yoga interventions effectively improve blood pressure, cholesterol levels, and glucose levels among hypertensive patients. Also, Yoga was found to be more effective in reducing blood pressure levels; Brisk walking was more effective in lowering cholesterol levels compared to yoga. Brisk walking and yoga interventions are effective in improving blood pressure, cholesterol levels, and glucose levels among hypertensive patients. These findings support the integration of non-pharmacological interventions into hypertension management strategies. Healthcare professionals should consider patient preferences, clinical characteristics, and cultural factors when recommending interventions for hypertensive individuals.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Author has declared that no competing interests exist.

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