



## Influence of Yoga on Blood Pressure and Anxiety Among Adults With Hypertension

### KEYWORDS

Systole, Diastole, Anxiety, Hypertension, yoga

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**ABSTRACT** *Background: Hypertension is a major chronic lifestyle disease and an important public health problem. This leads to numerous micro/macro vascular complications and subjects with hypertension are known to have a two-fold higher risk of developing coronary artery disease, four times higher risk of congestive heart failure and seven times higher risk of cerebrovascular disease compared to normotensive subjects.*

*Aim: This community based study tested the efficacy of yoga controlling hypertension by studying its impact on Blood pressure and Anxiety among Hypertension Adults, Kancheepuram district, Tamil nadu, India.*

*Design: Experimental before and after design .*

*Setting/participants: villages under Kattankulathur block, 238 subjects aged 30 – 60 who were being treated for mild and moderate hypertension took part in the study.*

*Intervention: The group allocated to practice yoga exercises for 5 days for 2hrs daily and continued performing twice daily for 12 weeks with regular treatment. The control group are also under medications but not given any specific exercises. The data were analyzed by proportions, chi-square tests, student independent t-test, Karl Pearson's correlation and 95% confidence intervals.*

*Results: The study shows that the mean systolic BP & Anxiety in interventional group differed significantly. As regards SBP in the pre & post intervention setting the mean SBP is reduced from 152.75 to 138.51 (14.24) mm of hg and For control group, 152.85 to 152.38 (-0.47) mm of hg . This fall in SBP in Intervention group was statistically significant ( $p < 0.05$ ) compared to the control group. Likewise for DBP, it is reduced from 94.51 to 86.17 (8.34) mm of hg whereas the change in DBP values of the control group was not significant. State trait Anxiety Inventory was used to assess the level of Anxiety and showed a mean reduction of 12.6% state anxiety and 11.3% trait anxiety among interventional group.*

*Conclusions: The yoga asanas were very simple and can be done in the home setup with the daily activities to decrease the blood pressure and Anxiety to avoid Blood Pressure related complications*

### Introduction:

Hypertension is a major chronic lifestyle disease and an important public health problem. A recent report indicates that nearly 1 billion adults had hypertension in 2000 and this is predicted to increase to 1.56 billion by 2025. This leads to numerous micro/macro vascular complications and subjects with hypertension are known to have a two-fold higher risk of developing coronary artery disease, four times higher risk of congestive heart failure and seven times higher risk of cerebrovascular disease compared to normotensive subjects. According to WHO (2002) in cardio vascular diseases prevention and control estimated 600 million people affected with hypertension world wide. WHO (2002) reports that hypertension causes 5 million premature deaths each year worldwide, causing 13% of global fatalities.

Hypertension cannot be eliminated because there are no vaccines to prevent the development of Hypertension, but its incidence can be decreased by reducing the risk factors for its development, which include obesity, high dietary intake of fat and sodium and low intake of potassium, physical inactivity, smoking and excessive alcohol intake (Das SK, 2005). For established Hypertension, efforts are to be directed to control Blood Pressure by lifestyle modifications.

Normalization of Blood Pressure reduce cardio vascular risks for cardiovascular death, Myocardial infarction and Cardiac arrest), provides renoprotection( prevention of the onset or slowing of proteinuria and progression of renal dysfunction to end stage renal disease in patients with Hypertension, Diabetes mellitus type 1 & 2 and chronic renal disease) and decreases the risk of cerebrovascular events(stroke and cognition impairment), as has been amply demonstrated by a

large number of randomized clinical trials.

Several studies have shown that Blood Pressure can be reduced by lifestyle modification. Although the reductions appear to be trivial, even small reductions in systolic Blood Pressure (for ex. 3-5mm Hg) produce dramatic reduction in adverse cardiac events and stroke. On the bases of the results of clinical and observational studies, it has been recommended that more emphasis be placed on lifestyle / behaviour modification to control Hypertension.

Hypertension is the leading cause of cardiovascular disease worldwide. Prior to 1990, population data suggested that Hypertension prevalence was decreasing; however, recent data suggest that it is again on the rise.

In 1999-2002, 28.6% of the U.S. Population had Hypertension. The Prevalence of Hypertension has also been increased in other countries and an estimated 9.72 million people in the world are suffering from this problem. Incidence rates of Hypertension range between 3% and 18% depending on the age, gender, ethnicity and body size of the population studied. Despite advances in Hypertension, control rates continue to be suboptimal only about one third of all Hypertensives are controlled in the United States. Programme that help to improve Hypertension control rates and prevent Hypertension are urgently needed public health problem(R. McCaffrey, 2005)

Yoga has become increasingly popular in western countries as a means of exercise and fitness (Stevens J, 2000). It is an ancient mind- body discipline that has been widely used in India for improving strength flexibility, and may help con-

tol physiological variables such as Blood pressure , respiration and heart rate, and metabolic rate to improve overall exercise capacity (Raub JA., 2002)and in the management of hypertension, diabetes and related chronic insulin resistance conditions (Ray US et.al., 2001)and may hold promise as a therapeutic intervention and health measure for all population. There is a growing body of research suggesting that practice of yoga may reduce insulin resistance syndrome (IRS) related risk factors for CVD, and may attenuate signs, reduce complications, and improve the prognosis of those with frank or underlying disease.

The aim of the present study is to assess whether the specific yoga practices controls Blood pressure and Anxiety so that it reduces the complications of hypertension.

**Method**

**Participants and selection:**

An experimental design was adopted for the study which was conducted in 8 Villages in Kattankulathur Block, a total of 238 samples were selected non equivalently from eight villages, in which 118 samples were included under interventional group from four villages and remaining 120 samples were under control group from four villages by using simple random technique (lottery method). The study group was 238 hypertensives of mild and moderate hypertension (140-169 mm hg SBP and/or 90-109mm hg DBP), aged 30 – 60 years , known hypertensive for one to five years and are under antihypertensive medications. The Inclusion criteria for sample selection includes hypertensive clients residing in selected 8 villages at Kattankulathur Block, B.P (140-169 mm hg SBP and/or 90-109mm hg DBP), and willing to participate. The exclusion criteria include who are Diabetis mellitus, Asthma, Hyper cholestremia, Alcoholics, Smokers, antenatal and postnatal mothers. The research proposal was approved by the institutional ethics committee of SRM University, Kattankulathur, Kancheepuram district, Tamil nadu, India. In all cases, informed consent was obtained from subjects .

**Study variable:**

Information was collected through personal interview using a structured questionnaire followed by a physical examination measurement of blood pressure by trained personnel. Blood pressure was recorded in the sitting position in the right arm to the nearest 2mm Hg using the mercury sphygmomanometer (Diamond Deluxe BP apparatus, Pune, India). Two readings were taken 5 minutes apart and mean of two was taken as the blood pressure. Spielberg's Standardised State trait Anxiety Inventory was used to assess the state and trait level of Anxiety.

**Intervention:**

The experimental group has undergone a course of yoga training. It consists of

- i. Pranayama (Nadhisudhi pranayama)
- ii. Yogasanas(4) - Shavasana, Uthanasana, Pavanmuktasana and Ardha Halasana
- iii. Meditation. (OM Chanting)

This is given as a 5 days intensive continous training of 2 hrs/ day for 10 hrs. It should be practiced regularly 40 – 50 mins for at least 5 days/week for 12weeks .

**Results and Discussion:**

The aim of this study was to study the effect of Yoga on Blood pressure and Anxiety among Hypertension. Participants in the yoga group showed increased confidence overtime in recommending the yoga program to their friends who are Hypertensives and expressed high degree of satisfaction with the program (Damodaran et.al., 2002). The mean gain score for obtained Systolic and Diastolic Blood Pressure have been shown below in Table 1.

**Table 1: SUMMARY OF SBP REDUCTION AMONG YOGA AND CONTROL GROUP**

	MEAN SBP				Mean Difference	% Difference in score with 95% CI
	Base-line	4 <sup>th</sup> week	8 <sup>th</sup> week	12 <sup>th</sup> week		
Experiment	152.75	147.59	143.42	138.51	14.24	9.3%(8.8% - 9.9%)
Control	152.85	152.33	152.38	152.38	0.47	0.3%(0.1% - 0.6%)

**CI – Confidence Interval**

The pre intervention and post intervention values of Blood Pressure after a period of 12 weeks are summarized in Table 1 .As regards SBP in the pre & post intervention setting the mean SBP is reduced from 152.75 to 138.51 (mean gain of 14.24 mm of hg) and For control group, 152.85 to 152.38 (-0.47) mm of hg . This fall in SBP in Intervention group was statistically significant (p<0.05) compared to the control group, wherein the fall was not significant. These findings were supported by a study that yoga and meditation given a positive effect on blood pressure heart rate and ECG (Seema malini, 2012).

**Table 2: Summary of DBP Reduction among Yoga and control group**

Baseline	MEAN DBP				Mean Difference	% Difference in score with 95% CI
	4 <sup>th</sup> week	8 <sup>th</sup> week	12 <sup>th</sup> week			
Experiment	94.51	91.28	89.58	86.17	8.34	8.8% (8.2% - 9.2%)
Control	94.77	93.93	94.12	94.23	0.53	0.6% (0.2% - 1.1%)

Table-2 shows DBP reduction from 94.51 to 86.17 (mean gain of 8.34 mm of hg) whereas the change in DBP values of the control group was not significant. Similarly among 25 participants, it was proved there was a significant reduction of SBP/DBP by 4.3/ 2.3 mm of Hg after 8 weeks proved the effect of yoga in preventing/ controlling hypertension (Hema Subramaniam, 2011), and Meditation treatment among 67 participants proved improvements in quality of life, anxiety reduction, and blood pressure control. (Sheng-Chia Chung 2012)

**Table 3: CHI SQUARE TEST TO COMPARE THE LEVEL OF SBP**

Level of SBP	Group				Chi square test	
	Experiment		Control			
	n	%	n	%		
Pre test	Normal	0	0.0%	0	0.0%	$\chi^2=1.31$ P=0.51 DF=1 Not Significant
	Mild	80	67.8%	77	64.2%	
	Moderate	38	32.2%	43	35.8%	
Post test (12 weeks)	Normal	35	29.7%	2	1.7%	$\chi^2=46.02$ P=0.001*** DF=2 Significant
	Mild	75	63.6%	84	70.0%	
	Moderate	8	6.8%	34	28.3%	

**\*\*\*Very high significant**

Table 3 shows, Pre test and post test level of SBP among hypertensive clients was analysed using Pearson chi square test. In the pre test, regarding SBP it was found that 67.8%

of adults had Mild Hypertension and 32.2% of adults had Moderate Hypertension. On post test, 63.6% had Mild , 6.8% Moderate hypertension and 29.7% normal. It proves statistically significant difference between experiment and control group on level of DBP. These findings are supported by a study to assess the occurrence of breathing controlled by respiratory comprised of short inhalations and long exhalations showed a significant decrease in both systolic and diastolic B.P. at the end of 6 months (Cea Ugarte 2007) .

**Table 4: CHI SQUARE TEST TO COMPARE THE LEVEL OF DBP**

Level of DBP	Group				Chi square test	
	Experiment		Control			
	n	%	n	%		
Pre test	Normal	7	5.9%	7	5.8%	$\chi^2=0.69$ $P=0.87$ DF=3 Not Significant
	Mild	69	58.5%	76	63.3%	
	Moderate	36	30.5%	31	25.8%	
	Severe	6	5.1%	6	5.0%	

Post test (12 weeks)	Normal	68	57.6%	7	5.8%	$\chi^2=78.42$ $P=0.001$ *** DF=3 Significant
	Mild	42	35.6%	76	63.3%	
	Moderate	8	6.8%	34	28.3%	
	Severe			3	2.5%	

\*\*\*Very high significant

Table 4 shows, Pre test and post test level of SBP among hypertensive clients was analysed using Pearson chi square test. In the pre test, for DBP , it was found that 5.9% , 58.5%, & 30.5% of adults had Mild , Moderate and Severe level of Hypertension respectively, Whereas in post test, 57.6% Normal, 35.6% had Mild , 6.8% Moderate hypertension and none of them in severe hypertension. In control group, there was no significant mean score difference between pre test and post test . These findings were consistent with Rajesh (2006), proved that yoga as a adjunctive treatment in patients of essential hypertension by observing their effects on Blood pressure and other autonomic parameters like heart rate and respiratory rate. 100 patients of essential hypertension either receive antihypertensive drugs or un medicated were selected randomly. All parameters were recorded again after mental relaxation and slow breathing. The results showed that even a single session of mental relaxation or slow breathing could result in a temporary fall in B.P.

Participants in the yoga group showed increased confidence overtime in recommending the yoga program to their friends who are hypertensives and expressed high degree of satisfaction with the program (Damodaran et.al., 2002).

**Table 5: EFFECT OF YOGA ON ANXIETY**

	ANXIETY	Mean score	SD	Mean Difference	% Difference score	t value	P value	Significance
Experiment	State - Pre -Post	50.42 40.33	7.65 7.14	10.08	12.6	29.12	0.001	S
	Trait - Pre - Post	46.31 37.27	9.05 8.18	9.04	11.3	52.54	0.001	S
	Overall - Pre - Post	96.72 77.60	15.07 13.13	19.12	11.9%	44.81	0.001	S
Control	State - Pre -Post	49.54 48.98	8.17 8.18	0.56	0.7%	1.80	0.07	NS
	Trait -Pre - Post	45.98 45.55	8.42 7.75	0.43	0.5%	1.13	0.26	NS
	Overall - Pre - Post	95.52 94.53	15.09 14.51	0.99	0.6%	1.32	0.24	NS

S-Significant, NS-Non Significant

Table no-5 proves that hypertensive clients are reduced 11.9% of anxiety score after having Yoga, whereas control groups reduced only 0.7%. Differences between pre test and post test score was calculated using and mean difference with 95% CI method and proportion with 95% CI method and very high significant difference was observed between experiment and control group using student's dependent t-test . Similarly the effects of relaxation breathing exercise on Anxiety and Depression on 35 patients with Hypertension was done(Kim S.,2005). Anxiety was measured by STAI & Depression was measured by Beck Depression Inventory. The findings indicated that a relaxation breathing exercise would improve Anxiety levels in patients with Hypertension

Different studies stated that the benefits of yoga could only be maintained by the regular practice and integration of these techniques in the day to day life (Patel CH. 2007). . Regular yoga and meditation is required to maintain positive effects on the blood pressure and baseline weight (Hafner R.J). . Several studies have shown that yoga also has long term benefits for hypertension with its use of mediation, relaxation, stretching, posture improvement, and more helping reduce stress and anxiety in the patient, which are that are thought to be contributing factors to the elevation of blood pressure (Singh et al, 2012).

**CONCLUSION:**

The present study was contemplated to put forth the effect

of yoga practice on the Blood pressure and Anxiety of persons who were practicing the same and to compare them with those of control group in the same age group. The reduction in Anxiety and Blood pressure indicated that the persons who practised yoga regularly were at a lower risk of developing Cardio vascular diseases as compared to those who did not perform any kind of yoga. Thus yoga has positive effects on the Cardio vascular system and this can be encouraged to be used as a non- pharmacological method to prevent heart diseases.

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