

“Comparative Study of Two Sets of Lifestyle Modification Measures in Management of Essential Hypertension- A Randomized Control Study”

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Abstract

Introduction- The updated hypertension guidelines presents new treatment recommendations, which include lifestyle changes as well as BP-lowering medications. Various factors and lifestyle behaviors are associated with effective blood pressure control.

Method- This was a intervention, randomised ,pre and post study.

60 essential hypertension (EH) patients in the age group of 20-60years, including both sexes and taking treatment since 5 to 10 years. The study had 3 groups namely control , study1 & study 2.. Patients of both the groups were on their routine antihypertensive medication.

Result- The main finding was fall in post test values of systolic blood pressure, diastolic blood pressure , pulse in both the study groups but the mean difference was more in study1 group. The finding of diastolic pressure is more pronounced as descriptive statistics is significant. As regards to BMI, post test finding in both the study group is significant but the mean difference is more in study 2 group.

Conclusion- The practice of yoga and guided self imagery along with standard life style measures like exercise and diet should be adopted in the management of essential hypertension. And this is to be done as an adjunct to routine antihypertensive therapy.

KEYWORDS- Essential Hypertension, Yoga, Guided self imagery, Diet , Exercise.

Introduction-

Hypertension has been recognized as a major risk factor for development of several cardiovascular diseases.

The direct and indirect medical costs of hypertension are huge, considering the number of patients and families that are affected, and the related costs of treatment, including blood pressure-related complications. Effective blood pressure management is multifactorial

and requires the commitment of patients, families, healthcare providers, and communities.(1)

Hypertension is difficult to diagnose until medical complications occur, since patients rarely present with specific symptoms in the early stages of the disease. Hypertension is also difficult to manage effectively, as is consistent treatment after it is diagnosed, due to lack of awareness and patient compliance.(2)

Conclusions from the eighth Joint National Committee guidelines, which is based on evidence from randomized controlled trials, suggest that a healthy eating, weight management, and appropriate physical activity are essential for the management of high blood pressure in adults, since these lifestyle managements have the potential to improve blood pressure control and even reduce the need for medication.(3).

Also various factors and lifestyle behaviors are associated with effective blood pressure control.(4). Lifestyle is referred to an individual's healthy and unhealthy behaviors that can have impact on their health status. A healthy promoting lifestyle is one in which self-initiated, continuous, daily activity is undertaken with the deliberate aim of increasing or promoting an individual's health and wellbeing . Studies have revealed that the most important health risk factors include poor diet, inactivity and low physical inactivity, as well as smoking which are the main factors for an individual's lifestyle, and 80% of heart diseases could be avoided by making changes in these factors .(5)

Though several antihypertensive drugs are today available and clinical trials have demonstrated a reduction of cardiovascular complications and mortality rate consequent to lowering of blood pressure [6-11], only a third of treated hypertensive patients achieves the target values.

Yoga has been shown to be one of the most popular CAM therapies with growing use particularly in older hypertensive patients (12-15).

Guided visual Imagery has powerful physiological consequences. The body tends to respond to mental imagery exactly as it would to a genuine external experience. Numerous studies have shown that imagery can affect almost all major physiologic control systems in the body, including respiration, heart rate, blood pressure, metabolic rates in cells, gastrointestinal motility and secretion, sexual function, cortisol levels, blood lipids, and even immune responsiveness (13).

Nonpharmacologic strategies have been shown to help lower blood pressure. Lifestyle modifications are recommended for all patients with hypertension. The American Heart Association/American College of Cardiology lifestyle management guideline recommends a diet emphasizing vegetables, fruits, and whole grains; limiting sodium intake to less than 2,400 mg per day; and exercising three or four times per week for an average of 40 minutes per session. (16)

The Dietary Approaches to Stop Hypertension (DASH) diet is low in sodium and high in potassium, magnesium and calcium (17). DASH is a carbohydrate-rich eating plan that emphasizes increasing consumption of fruits, vegetables, and low-fat dairy products and reducing the consumption of saturated fat, total fat, and cholesterol by decreasing consumption of red meat, sweets, and added sugars. The dietary approaches to stop hypertension (DASH) diet recommends lots of fruits and vegetables, low-fat dairy products, low in total fat, saturated fat and cholesterol (18)]. DASH diet has produced effective results in lowering hypertension (19). But it has been found in many studies that ,other than their staple diets ,patients do not respond to above mentioned diets, on a regular basis.

Moreover, several clinical trials [20-22] have demonstrated that comprehensive dietary changes can play an important role in the etiology, prevention and treatment of hypertension. In particular, a diet rich of fruits, vegetables, fiber and fish oil is effective in reducing blood pressure and its related cardiovascular complications and mortality.

Must of studies [23-27] reported a significant reduction of blood pressure after an exercise session but results are difficult to compare .

Although this variability, several meta-analyses and epidemiological evidences have consistently shown a total beneficial effect of a regular physical activity [28-30).

Objectives of the study were--

1. To find out the difference in systolic blood pressure, diastolic blood pressure, pulse & BMI at post intervention, in study1 group.
2. To find out the difference in systolic blood pressure ,diastolic blood pressure, pulse & BMI at post intervention ,in study2 group
3. To compare study 1 finding with control group.
4. To compare study 2 finding with control group.
5. To relate intergroup difference.

METHODOLOGY

Study Design And subjects- This was a intervention, randomised ,pre and post study.

60 essential hypertension (EH) patients in the age group of 20-60years, including both sexes and taking treatment since 5 to 10 years .

patients with essential hypertension (EH) who were prescribed routine antihypertensives.

This study was taken up ,after obtaining permission from institutional ethical committee.

An *inclusion criterion* was -

1.available blood pressure data of patients for each clinic visit to assess hypertension control.

2. Age between 20 to 60 years of both sexes.
3. Duration of hypertension between 5-10 years.
4. No prior record of following life style modifications.
5. Patients with essential hypertension(EH) consenting to the study.

Exclusion criteria-

1. Age less than 20 years and more than 60 years.
2. Hypertensive patients with major co- morbidities like cardiovascular disease.diabetes mellitus or Nephropathy.
3. Hypertensive patients having cancer
4. Patients with EH not consenting to the study.

Study setting- Department of Physiology, Jawaharlal Nehru Medical College, Wardha.

Period of Study – 1 ½ years.

Intervention-

By random selection 60 patients with essential hypertension were allocated to the study. The study had 3 groups namely control , study1 & study 2.. Patients of both the groups were on their routine antihypertensive medication. Pretest was taken 1 week before initiation of intervention.

The study1 group of 20 EH patients were subjected to intervention for 3 days with 1 hour duration of work out. The schedule was as follows-

- 1st day- orientation to the disease through video programme and lectures.
- 2nd day- performance of asanas & pranayam.
- 3rd day – performance of self imagery techniques..

The study2 group of 20 EH patients were subjected to intervention for 3 days with 1 hour duration of work out. The schedule was as follows-

- 1st day- orientation to the disease through video programme and lectures.
- 2nd day- performance of exercise namely walking for 30 minutes at dawn or dusk for 5 days a week.
- 3rd day -explanation of diet chart .

Control group had 20 patients age & sex matched. They were on their routine antihypertensive treatment only.

Duration of intervention was 3 months.

Post test was taken 3 months after intervention was initiated.

At the outset, basic characteristics including sex, age, monthly income, education, marital status, physical activity, body mass index (BMI), systolic blood pressure, diastolic blood

pressure, pulse, family medical history, and other prescribed medication was documented.

The study 1 group 1 performed the following asanas namely- Tadasan, Ardhakatchakraasan, Pawanmukthasan, Shrivasan, Bakrasan & Bhujangasan. Pranayam performed was Anolom –Vilom & Bhramri.

The study 1 group practised guided visual imagery on the 3rd day. Pre packaged DVD & audio compact disc (CD) guided imagery relaxation were used for the relaxation. In this, the patient was first asked to relax in a chair. Then the patient was made to imagine healing rays of yellow light was falling on all the blood vessels in his body, with a soft affirmation that his blood pressure was coming back to normal.

Advocated diet for the subjects in study 2 group was Indian staple diet with reduced salt intake, lot of fresh fruits and green vegetables, garlic & turmeric.

The study 2 group also underwent brisk walking for 30 minutes daily at dawn or dusk for 5 days a week for 3 months.

Measurements-

In our study normal blood pressure (BP) was defined as less than 140 mm Hg systolic and 90 mm Hg diastolic. BP was recorded in the sitting posture with the sphygmomanometer kept at heart level. Mercury sphygmomanometer used was of the diamond make. An average of 3 consecutive reading with an interval of 30 minutes was taken as the accepted BP level.

Change in BMI was calculated by comparing measurement data, namely height and weight, at the initiation of the study and the conclusion of the study. An increase in BMI by $>0.5 \text{ kg/m}^2$ or $\leq 0.5 \text{ kg/m}^2$ was also evaluated.

Primary outcome of this study was difference in systolic blood pressure, diastolic blood pressure and pulse between pre & post test in all the groups. Secondary outcome was BMI in all the groups.

Statistical Analysis- Statistical analysis was done by using descriptive and inferential statistics using student's paired t test, one way ANOVA and Multiple Comparison Tukey Test and software used in the analysis were SPSS 24.0 version and $p < 0.05$ is considered as level of significance.

Sample size-60

$$2 \times SD^2 (Z \alpha + Z \beta)^2 / d^2$$

SD standard deviation : 20 mmHg,

Z α : 1.64 one tailed at 0.05 % significance

Z β : 0.84, 80 % power

d = size of difference of clinical importance - here 10.0.

49.8 or 50.

Method of Randomization- Simple Randomization.

Method used to generate the random allocation sequence-

Three interventions-

A 1 to 3 B 4 to 6 C 7 to 9 ignore(0).

Random digits: 7 2 4 0 2 3 6 3 1 8 ... Treatment assigned: (5A, 2B, 2C) C A B - A A B A A C ... Number assigned to each group: 5A, 2B, 2C

Mechanism used to implement the random allocation sequence-Neither the subject nor the investigator knew the intervention assignment before the subject's decision to enter the study. This was done using sequentially numbered, opaque, sealed envelopes (SNOSE) containing group numbers prepared by facilitators of the study.

Randomization concealment-the sequence of intervention assigned was concealed from the investigator and subjects before allocation. So, neither participant nor investigator knew about the investigation group of a participant until a participant was randomly allocated to a group.

Allocation Randomization- Facilitators generated the allocation sequence. Hypertensive patients visiting AVBRH hospital were enrolled as participants for the study by the attending physicians. A attendant of Pharmacology department assigned participants to their groups-

Implementation Blinding- the outcome evaluators were blinded to the study.

Periods of Recruitment- It was of 3 months.

Efforts to maintain compliance of patients- This was done using log books of asanas guided visual imagery , diet and exercise charts.

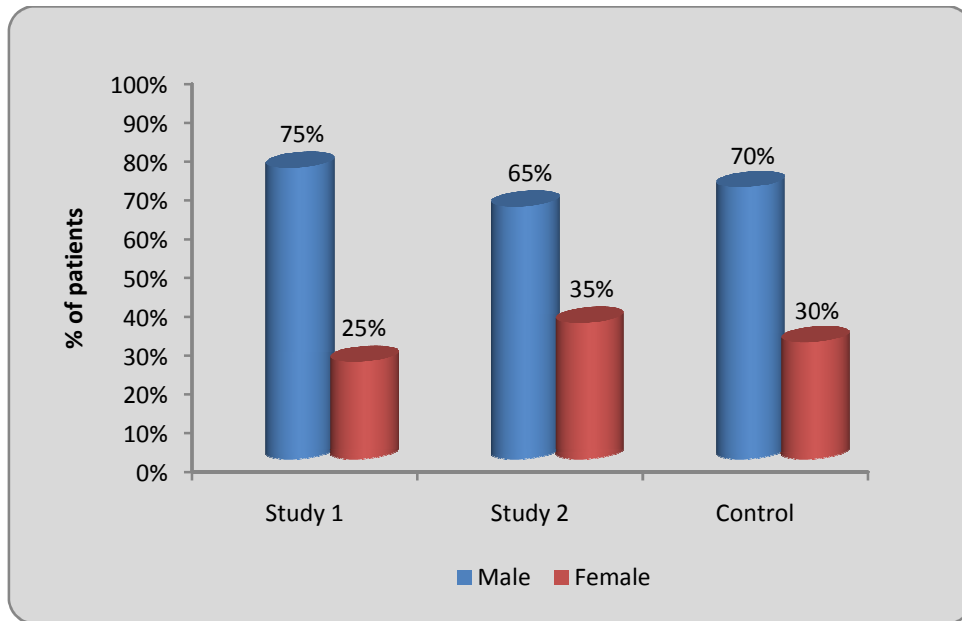
Handling of lost to follow up patients- This was addressed by recruiting extra 1% i.e 6 eligible patients for the study.

Observation

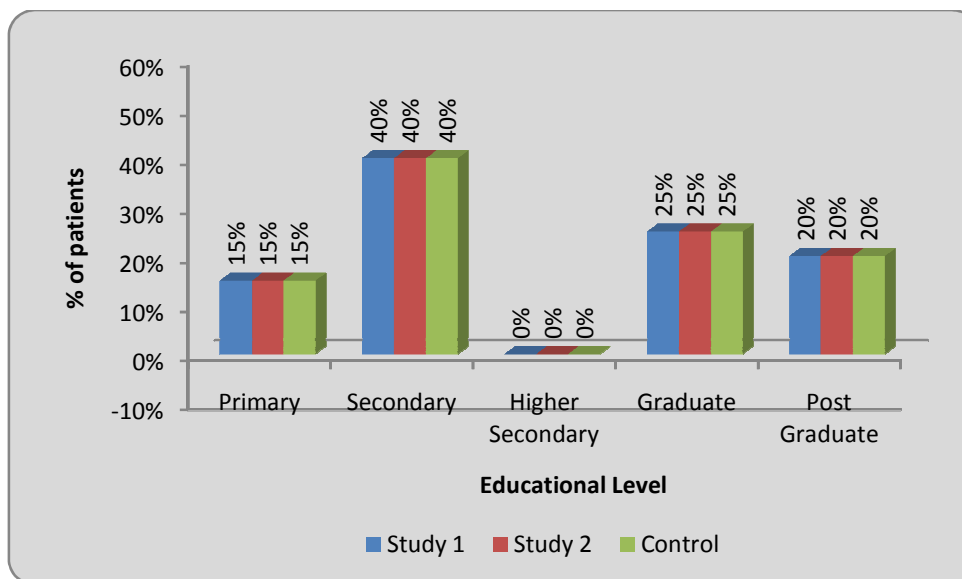
Table 1: Age wise distribution of patients in three groups

Age Group(yrs)	Study 1	Study 2	Control
31-40 yrs	6(30%)	6(30%)	6(30%)
41-50 yrs	8(40%)	8(40%)	8(40%)
51-60 yrs	6(30%)	6(30%)	6(30%)
Total	20(100%)	20(100%)	20(100%)
Mean±SD	45.75±8.63	45.75±8.63	45.75±8.63
Range	32-60 yrs	32-60 yrs	32-60 yrs

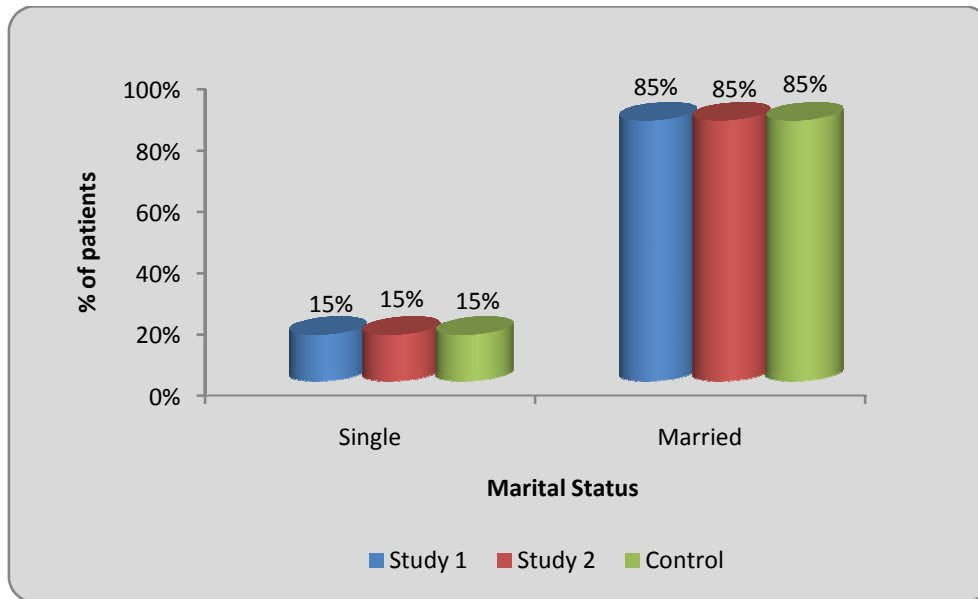
Graph 1: Gender wise distribution of patients in three groups



Graph 2: Distribution of patients in three groups according to education



Graph 3: Distribution of patients in three groups according to marital status



Graph 4: Distribution of patients in three groups according to family history

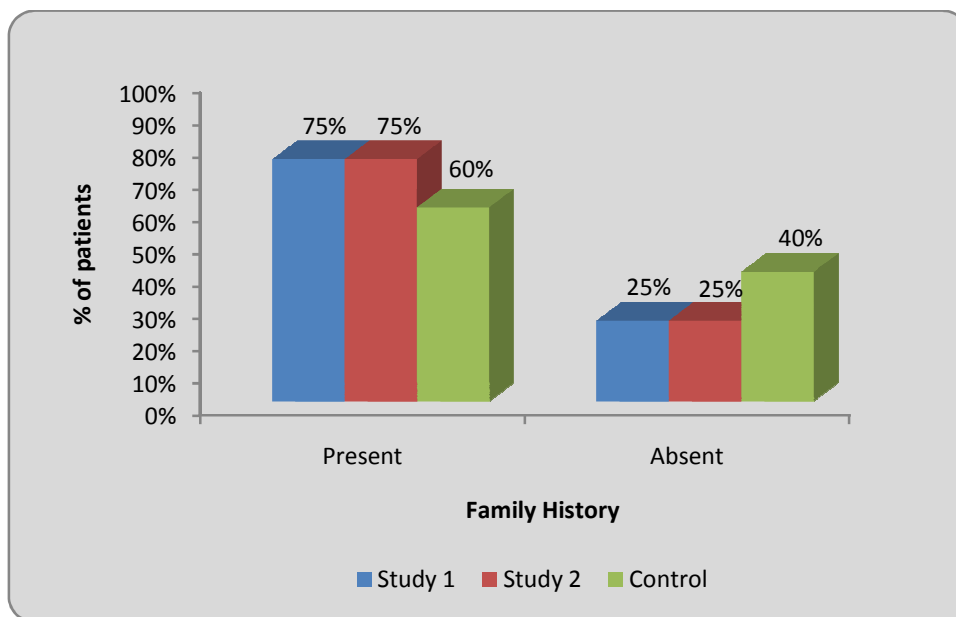


Table 2: Comparison of SBP in three groups at pre and post test

Groups	Pre t/t	Post t/t	Mean Difference	t-value
Study 1	155.40±14.14	150.45±11.78	4.95±2.85	7.75 p=0.0001,S
Study 2	155.70±13.86	153.70±13.66	2±1.58	5.62 p=0.0001,S
Control	156.30±11.09	156.30±11.09	0±0	-

Table 3: Comparison of mean difference in SBP in three groups

Descriptive Statistics

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Study 1	20	150.45	11.78	2.63	144.93	155.96	120.00	167.00
Study 2	20	153.70	13.66	3.05	147.30	160.09	120.00	174.00
Control	20	156.30	11.09	2.48	151.10	161.49	142.00	172.00

One Way ANOVA

Source of variation	Sum Squares	df	Mean Square	F	p-value
Between Groups	343.63	2	171.81	1.149	0.324,NS
Within Groups	8521.35	57	149.49		
Total	8864.98	59			

Multiple Comparison: Tukey Test

Group		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Study 1	Study 2	-3.25	3.86	0.680,NS	-12.55	6.05
	Control	-5.85	3.86	0.292,NS	-15.15	3.45
Study 2	Control	-2.60	3.86	0.780,NS	-11.90	6.70

Graph 5: Comparison of mean difference in SBP in three groups

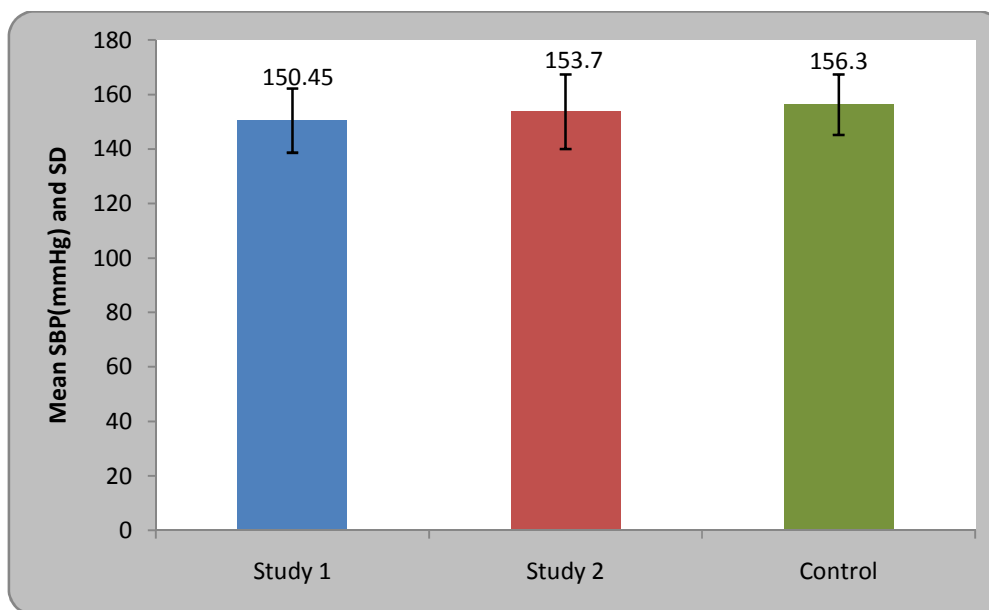


Table 4: Comparison of DBP in three groups at pre and post test

Groups	Pre t/t	Post t/t	Mean Difference	t-value
Study 1	93.90±6.40	90.25±4.96	3.65±3.71	4.39 p=0.001,S
Study 2	93.90±6.40	93.20±5.74	0.70±1.17	2.66 p=0.015,S
Control	95.50±5.42	95.50±5.42	0±0	-

Table 5: Comparison of mean difference in DBP in three groups
Descriptive Statistics

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Study 1	20	90.25	4.96	1.10	87.92	92.57	78.00	98.00
Study 2	20	93.20	5.74	1.28	90.51	95.88	80.00	104.00
Control	20	95.50	5.42	1.21	92.96	98.03	80.00	106.00

One Way ANOVA

Source of variation	Sum Squares	Df	Mean Square	F	p-value
Between Groups	277.033	2	138.517	4.77	0.012,S
Within Groups	1653.950	57	29.017		
Total	1930.983	59			

Multiple Comparison: Tukey Test

Group		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Study 1	Study 2	-2.95	1.70	0.202,NS	-7.04	1.14
	Control	-5.25	1.70	0.009,S	-9.34	-1.15
Study 2	Control	-2.30	1.70	0.374,NS	-6.39	1.79

Graph 6: Comparison of mean difference in DBP in three groups

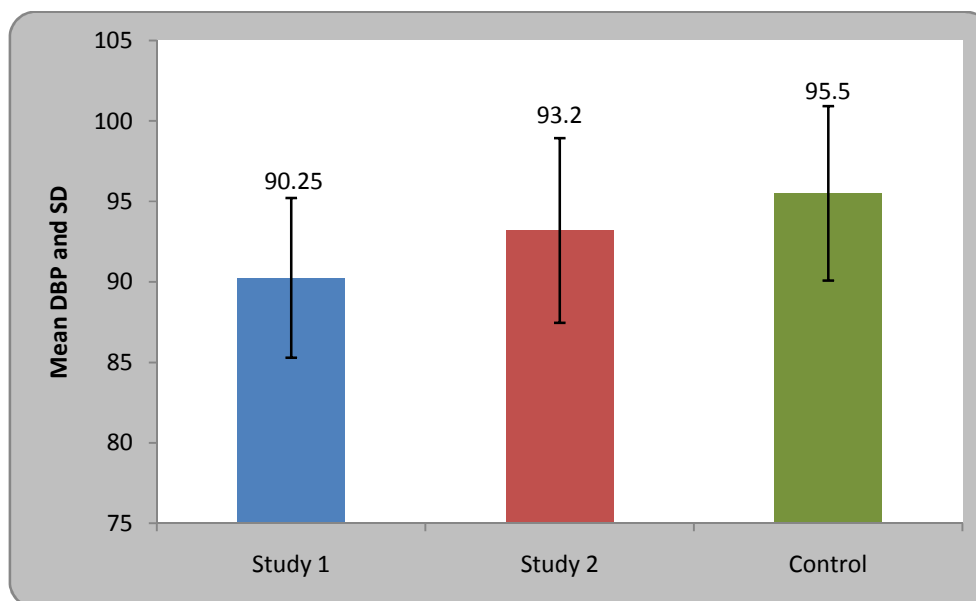


Table 6: Comparison of pulse in three groups at pre and post test

Groups	Pre t/t	Post t/t	Mean Difference	t-value
Study 1	77±4.07	74.90±3.14	2.10±2.10	4.47 p=0.001,S
Study 2	77±4.07	76.10±3.40	0.90±1.51	2.65 p=0.015,S
Control	77±4.07	77±4.07	0±0	-

Table 7: Comparison of mean difference in Pulse in three groups

Descriptive Statistics

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Study 1	20	74.90	3.14	0.70	73.42	76.37	70.00	82.00
Study 2	20	76.10	3.40	0.76	74.50	77.69	70.00	82.00
Control	20	77.00	4.07	0.91	75.09	78.90	70.00	86.00

One Way ANOVA

Source of variation	Sum Squares	df	Mean Square	F	p-value
Between Groups	44.40	2	22.20	1.74	0.18,NS
Within Groups	723.60	57	12.69		
Total	768	59			

Multiple Comparison: Tukey Test

Group		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Study 1	Study 2	-1.20000	1.12	0.539,NS	-3.91	1.51
	Control	-2.10000	1.12	0.159,NS	-4.81	0.61
Study 2	Control	-0.90000	1.12	0.705,NS	-3.61	1.81

Table 8: Comparison of weight in three groups at pre and post test

Groups	Pre t/t	Post t/t	Mean Difference	t-value
Study 1	61.70±10.06	60.70±9.09	1±1.86	2.39 p=0.027,S
Study 2	61.70±10.06	59.30±9.27	2.40±1.96	5.56 p=0.0001,S
Control	61.70±10.06	61.70±10.06	0±0	-

Table 9: Comparison of mean difference in weight in three groups Descriptive Statistics

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Study 1	20	60.70	9.09	2.03	56.44	64.95	40.00	80.00
Study 2	20	59.30	9.27	2.07	54.95	63.64	36.00	76.00
Control	20	61.70	10.06	2.25	56.99	66.40	36.00	82.00

One Way ANOVA

Source of variation	Sum Squares	df	Mean Square	F	p-value
Between Groups	58.133	2	29.067	0.323	0.72,NS
Within Groups	5128.600	57	89.975		
Total	5186.733	59			

Multiple Comparison: Tukey Test

Group		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Study 1	Study 2	1.40	2.99	0.887,NS	-5.81	8.61
	Control	-1.00	2.99	0.941,NS	-8.21	6.21
Study 2	Control	-2.40	2.99	0.704,NS	-9.61	4.81

Graph 7: Comparison of mean difference in weight in three groups

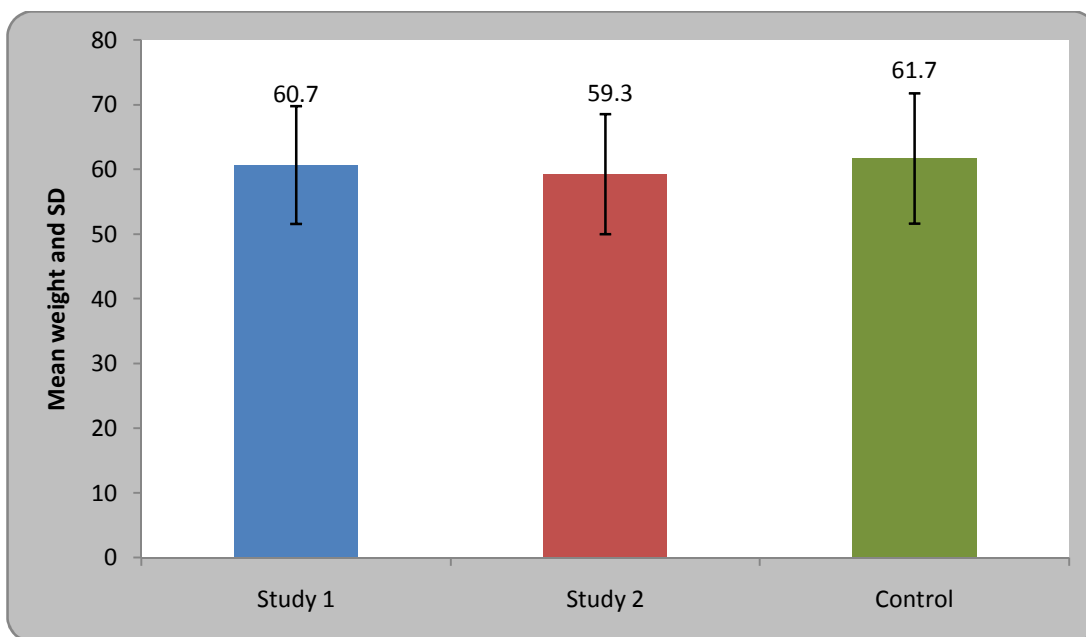


Table 10: Comparison of mean difference in height in three groups

Descriptive Statistics

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Study 1	20	5.31	0.31	0.07	5.16	5.46	4.40	5.60
Study 2	20	5.31	0.31	0.07	5.16	5.46	4.40	5.60
Control	20	5.31	0.31	0.07	5.16	5.46	4.40	5.60

One Way ANOVA

Source of variation	Sum Squares	df	Mean Square	F	p-value
Between Groups	0.000	2	0.000	0.000	1.00,NS
Within Groups	5.716	57	0.100		
Total	5.716	59			

Multiple Comparison: Tukey Test

Group		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Study 1	Study 2	0.00	0.10	1.000,NS	-0.24	0.24
	Control	0.00	0.10	1.000,NS	-0.24	0.24
Study 2	Control	0.00	0.10	1.000,NS	-0.24	0.24

Graph 8: Comparison of mean difference in height in three groups

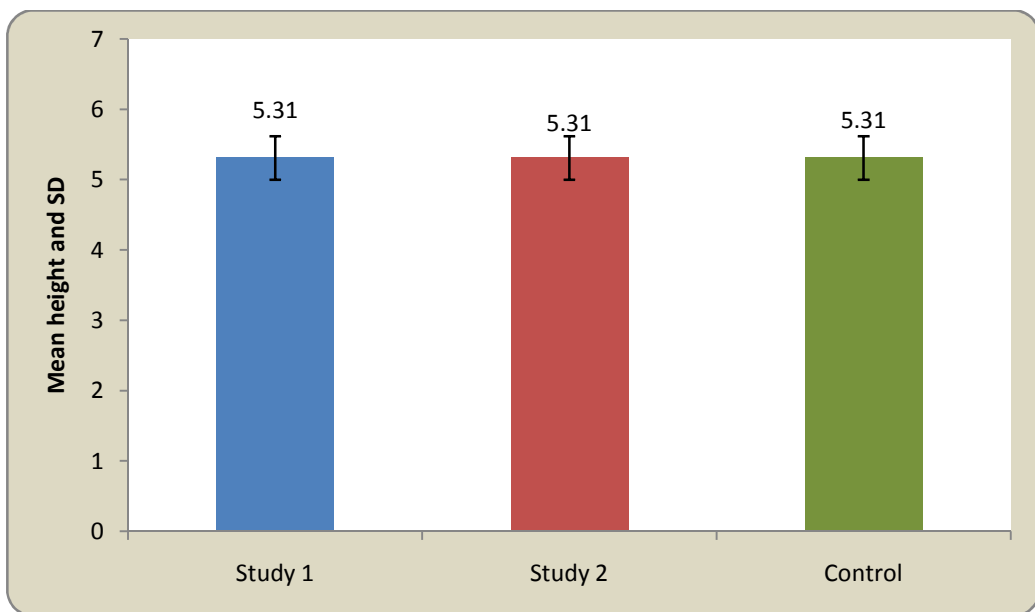


Table 11: Comparison of BMI in three groups at pre and post test

Groups	Pre t/t	Post t/t	Mean Difference	t-value
Study 1	24.15±4.63	23.65±4.28	0.50±0.82	2.70 p=0.014,S
Study 2	24.15±4.68	22.40±3.74	1.75±1.83	4.27 p=0.0001,S
Control	23.50±4.32	23.50±4.32	±	-

Table 12: Comparison of mean difference in BMI in three groups Descriptive Statistics

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Study 1	20	23.65	4.28	0.95	21.64	25.65	19.00	32.00
Study 2	20	22.40	3.74	0.83	20.64	24.15	18.00	30.00
Control	20	23.50	4.32	0.96	21.47	25.52	17.00	32.00

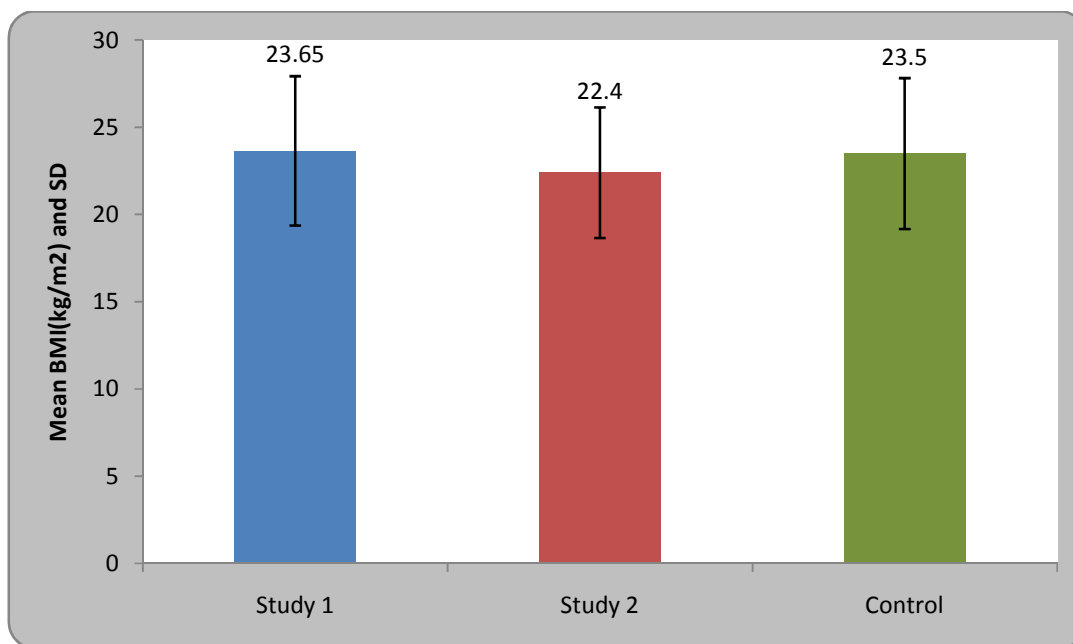
One Way ANOVA

Source of variation	Sum Squares	df	Mean Square	F	p-value
Between Groups	18.63	2	9.31	0.547	1.00,NS
Within Groups	970.35	57	17.02		

Multiple Comparison: Tukey Test

Group		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Study 1	Study 2	1.25	1.30	0.606,NS	-1.88	4.38
	Control	0.15	1.30	0.993,NS	-2.98	3.28
Study 2	Control	-1.10	1.30	0.678,NS	-4.23	2.03

Graph 8: Comparison of mean difference in BMI in three groups



Result-

Table 1 shows age distribution in all the three groups.

Table 2 shows post test finding in both the study group is significant, but mean difference is more in study 1 group. One way Anova & tukey test finding is not significant.(Table 3). Similar finding is for pulse, weight and height as seen from Table 6 , 7,8,9 and 10..

Diastolic pressure findings at post test is significant in both the groups but mean difference is more in study 1 group.(Table4). One way Anova test shows significance between and within groups. On applying Tukey test for multiple comparison it was found that study 1 and control finding was significant.(Table5).

Table 11 shows significant finding in BMI at post test in both the groups but the mean difference is more in study2. Findings of descriptive statistics on BMI is not significant(Table 12).

Discussion

In our study the main finding was fall in post test values of systolic blood pressure, diastolic blood pressure , pulse in both the study groups but the mean difference was more in study1 group. The finding of diastolic pressure is more pronounced as descriptive statistics is significant. As regards to BMI, post test finding in both the study group is significant but the mean difference is more in study 2 group. This goes to say that the intervention of diet and exercise affects BMI more than the

combination of yoga and guided self imagery. This weight reduction can curtail the future progression of the disease as is already known.

Whelton PK et al reported a reduction in systolic blood pressure of 5 mm Hg has been associated in observational studies with mortality reductions of 14% from stroke, 9% from heart disease, and 7% from all causes. (31).

Eisenberg DM et al observed in their study that of the various lifestyle interventions, physical activity and dietary intervention showed diminution in the blood pressure and reduce CVD events, which have emerged as the two most effective and physiologically desirable approaches. (32).

Agarwal RK et al in their study titled "to observe the effect of yoga along with medicines on hypertension, for better management" with n=40, Age 20- 65, had control group on medication only and yoga intervention group on medication & yoga practice .Control group BP before: 156.30/97.6, control group BP after: 143.5, yoga group BP before: 158/97.6, yoga group BP after: 125/82.2 Sig. for both control and yoga groups for SBP & DBP.Also finding was significant for SBP & DBP difference between groups.(33).

Chauhan et al. in their study "to evaluate the effect of 1 month yoga practice on body mass index and blood pressure" with n=90, experimental n=64 (25males 39 females). They found that Experimental before yoga: 136.9/84.7, experimental after yoga: 133/82.34. Control before yoga: 136.45/84, control after time: 136.36/83.9. They found that finding was significant for SBP & DBP.(34).

Das et al. conducted a study "to find out the effects of Integrated Approach of Yoga (IAY) on Essential Hypertension". n=120, Age 21- 65. SBP, DBP, BMI, HR, RR, HAR (Hamilton anxiety rating scale)were taken as parameters. Control group: advised to walk 30 minutes/ day 5 days a week for 3 weeks. Control group before: 139.17/94.87, control group after: 138.70/92.5, Yoga group before: 141.33/93.73, yoga group after: 130.80/87.73. Their finding was significant. for SBP & DBP(35).

Devi et al. did a study "to assess the effect of yoga on heart rate and blood pressure in mild hypertensive patients who are not on any form of medication" .n=50 (28 males and 22 females) Age 25-65. Convenience sample: Participants chosen from those who came to practise yoga at YTRC. resting HR, resting BP, HR response to standing, BP response to standing, valsalva ratio, BP response to sustained handgrip Interventional study 60 minutes/day, 6 days/week for 3 months Before yoga: 143.86/89.08, After yoga: 135.64/84.64 Their finding was significant. for SBP & DB.(36)

Satyanand et al. worked on a research aimed to" evaluate the effectiveness of yoga in the treatment of high blood pressure" .n=100, Age>18, Convenience sample: Patient recruited from outpatient Cardiology department. BP Matched controlled trial 60 minutes/day, 7 days/week, 12 weeks along with weekly doctors visits for both groups Control group BP before: 155.3/100.2, Control group BP after: 127.5/84.4, Yoga group

BP before: 154.2/100.3, Yoga group BP after: 122.3/81.7 Their finding was significant (37).

Prakash S et al conducted a study was to determine the role of yoga in management of hypertension. They found significant reduction in blood pressure levels in the study group compared to the control group. Finally concluded that the result supports the hypothesis and the research question that yoga therapy supplement with usual medical care for hypertension is more effective than the usual medical care alone. They have recommended that yoga therapy is safe and may be considered in Hypertensive patients as a potential means to lower the blood pressure levels.(38).

Marshall Hagins et al studied 17 research works on yoga and hypertension. Yoga had a modest but significant effect on systolic blood pressure (SBP) (-4.17 [-6.35, -1.99], $P = 0.0002$) and diastolic blood pressure (DBP) (-3.62 [-4.92, -1.60], $P = 0.0001$). They concluded that yoga can be preliminarily recommended as an effective intervention for reducing blood pressure (39).

Linden W et al reported that biofeedback techniques have been proven effective and may be considered in clinical practice to lower blood pressure.(40).

Pitsavos C et al reported that several epidemiological studies have confirmed the effectiveness of mediterranean dietary pattern. There is ample evidence that dietary change with reduced caloric intake, whether appropriate, increased consumption of fish, fruits and vegetables and reduced intake of saturated fatty acids offers an additional nutritional approach to the prevention and treatment of hypertension. (41-43). Kokkinos P et al in their study have found that mediterranean diet has all these beneficial properties because it is based on high consumption of olive oil, legumes, cereals, fruits, vegetables, fish and low consumption of meat and meat products (44).

These benefits of fruit and vegetables is due to the combined effect of reduced total caloric burden, antioxidant properties and vitamins intake.

Weight loss is another important lifestyle modification for reducing blood pressure. Weight loss of approximately 10 kg (22 lb) may reduce systolic blood pressure by 5 to 20 mm Hg. This finding was reported by Chobanian AV et al in their study.(45)

McDonald et al reported in their study that activities such as aerobic dancing, biking, walking and sports are recommended for at least half an hour per day (46). They have also found that excess body weight has a major impact on high blood pressure hence losing weight is an essential way of managing and preventing high blood pressure. Proper weight loss plan includes exercises and good nutrition. Therefore it is important to get a 30 minute workout at least 5 days a week. Guidelines for the management of arterial hypertension says that Every 1% reduction in body weight lowers systolic blood pressure by an average of 1 mmHg (47).

Physical activity determines a systemic adaptation of the arterial wall which might lead to decrease in peripheral resistance (48). Exercise training leads to a higher number of capillaries for muscle fiber by increasing a number of pro-angiogenic factors [49,50].

Conclusion

In this study we found out the difference in systolic blood pressure, diastolic blood pressure, pulse & BMI at post intervention, in study1 group. Similarly it was done for study 2 group. Intergroup relationship was studied.

We advocate the practice of yoga and guided self imagery along with standard life style measures like exercise and diet in the management of essential hypertension. And this is to be done as an adjunct to routine antihypertensive therapy.

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