IMPACTS OF AEROBIC VERSUS RESISTANCE TRAINING ON BLOOD PRESSURE IN HYPERTENSIVE PATIENTS

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ABSTRACT

Background: High-impact preparing and obstruction preparing are the two treatment strategy utilized in diminishing systolic circulatory strain, diastolic pulse and pulse. There is limited evidence for comparison of aerobic training and resistance training in reducing systolic blood pressure, diastolic blood pressure and heart rate. **Purpose of study:** To build up the impact of vigorous preparing and obstruction preparing on circulatory strain in hypertensive patients. **Method:** Total numbers of thirty patients were randomly assigned to receive either aerobic training or resistance training. Systolic blood pressure, diastolic blood pressure and heart rate were taken at baseline, 3rd week and 6th week in both the groups. **Result:** In both the gathering critical improvement happened in vigorous preparing and obstruction preparing. Between bunches investigation there was critical improvement in oxygen consuming preparing when contrasted and obstruction preparing. **Conclusion:** Both aerobic and resistance training were found to be effective in reducing systolic blood pressure, diastolic blood pressure and heart rate. But aerobic training is more effective in reducing systolic blood pressure, diastolic blood pressure and heart rate when compared with resistance training.

KEYWORDS: Systolic blood pressure; Diastolic blood pressure; Heart rate

INTRODUCTION

Hypertension is one of the nine driving danger factors affecting the worldwide weight of cardiovascular sickness [1]. It is estimated to lead to seven million deaths each year that is about 13% of the total death worldwide [2]. Hypertension (systolic and diastolic blood pressure > 140/90mmHg) is a major modifiable risk factor for cardiovascular disease. Elevated blood pressure levels have been shown to be a risk factor for stroke, congestive heart failure, myocardial infarction, peripheral vascular disease and end-stage renal disease [3]. Primary (or essential) hypertension is when the cause is unknown. The majority of hypertension cases are primary. It accounts for about 95% of cases. When there is a basic issue, for example, kidney infection or hormonal issues that can cause hypertension, it is called auxiliary hypertension [4]. Regular physical exercise has been recommended for the prevention and treatment of hypertension [5]. Bringing down of circulatory strain and avoidance of hypertension is in first example best by way of life changes. These include weight loss, moderation of alcohol intake, a diet with increased fresh fruit and vegetables, reduced saturated fat, reduced salt intake and increased physical activity [6]. The impacts of activity on clinical circulatory strain may be distinctive in normotensive and hypertensive subjects. The impacts of high-impact and opposition practice on clinical circulatory strain may be extraordinary, on the grounds that they have diverse mechanical qualities. Aerobic training is characterized by the execution of cycling, carried out with large muscle groups

contracting at mild to moderate intensities for a long period of time. On the other hand, resistance training (also called weight or strength training) is characterized by the execution of exercises in which muscles from a specific body segment are contracted against a force that opposes the movement [7].Both aerobic endurance exercise and resistance training can promote substantial benefits in physical fitness and health related factors in older individuals [8]. Vigorous aerobic exercise greaterly affects most extreme oxygen take-up (VO2 max) and related cardiopulmonary factors and it all the more successfully changes cardiovascular infection hazard factors related with the advancement of coronary supply route illness. Then again normal obstruction preparing offers the best potential for creating strong strength, perseverance and mass [9].

METHOD

DESIGN

Test study configuration was done with an example of 30 members. Members were arbitrarily allotted utilizing fixed envelope technique to get either vigorous preparing or opposition preparing. Educated assent was taken from all the members remembered for the examination.

SUBJECTS

The sample size was includes 30 subjects. Subjects were randomly divided into two groups. Group A having 15 subjects and Group B having 15 subjects. Inclusion criteria- Age < 65 years, both male and female, Essential hypertension- Stage 1& Stage2, Hypertension - Systolic blood pressure 140-179 mmHg and diastolic blood pressure 90-109 mmHg. Exclusion criteria- Patient with secondary hypertension, Left ventricular hypertrophy, recent myocardial infarction, three or more risk factors of CVD, Patients using more than one hypertensive drug [4].

INTERVENTION

Gathering A was given oxygen consuming preparing and Group B was given opposition preparing. Gathering A Stretching and low force activities of 10 minutes were given in each instructional meeting as warm-up before preparing. The aerobic training was given for three alternate days in a week at 60-70% of maximum heart rate for 6 weeks, up to the exhaustion level of the subjects. Omron Digital sphygmomanometer was used to measure heart rate during the aerobic exercise [10]. Heart rate, systolic and diastolic blood pressure were measured before and after the exercise in the sitting position. Recovery heart rate was measured at third minute of post exercise session in the aerobic training program. After the training session, cool down was given for 5-10 minutes. Maximum heart rate was calculated by using the formula: HRmax = 220-age Group B Resistance training program was given for alternate days for 6 weeks. In resistance training four sets and 10 repetitions were performed by the subjects, based on the Delorme and Watkins technique. It was started with 10 lifts with 50% of 10 RM, then 75% of 10 RM and progressed to 100% of 10 RM. Seven different types of exercises were abdominal curl ups, biceps curls, triceps extension, back extension, leg curls, side leg raises and knee extension [11].

OUTCOME MEASURE

Systolic blood pressure, diastolic blood pressure and heart rate were measured by Omron digital sphygmomanometer.

RESULTS

Analysis of data collected for systolic blood pressure, diastolic blood pressure and heart rate of 30 subjects was done by statistical analysis tests using SPSS and software version 16. The results were considered and statistically significant at $p<0.025$. The characteristics of the data were presented through tables and graphs. Mean and standard deviation of all the variables were calculated. Comparison between the groups for all the variables (SBP, DBP and HR) on baseline, 3rd week and 6th week was done using unpaired t test. Comparison of effect of treatment within the group on baseline, 3rd week and 6th week for all the variables was done using paired t test.

Table 1: Changes of SBP within Group A and Group B.

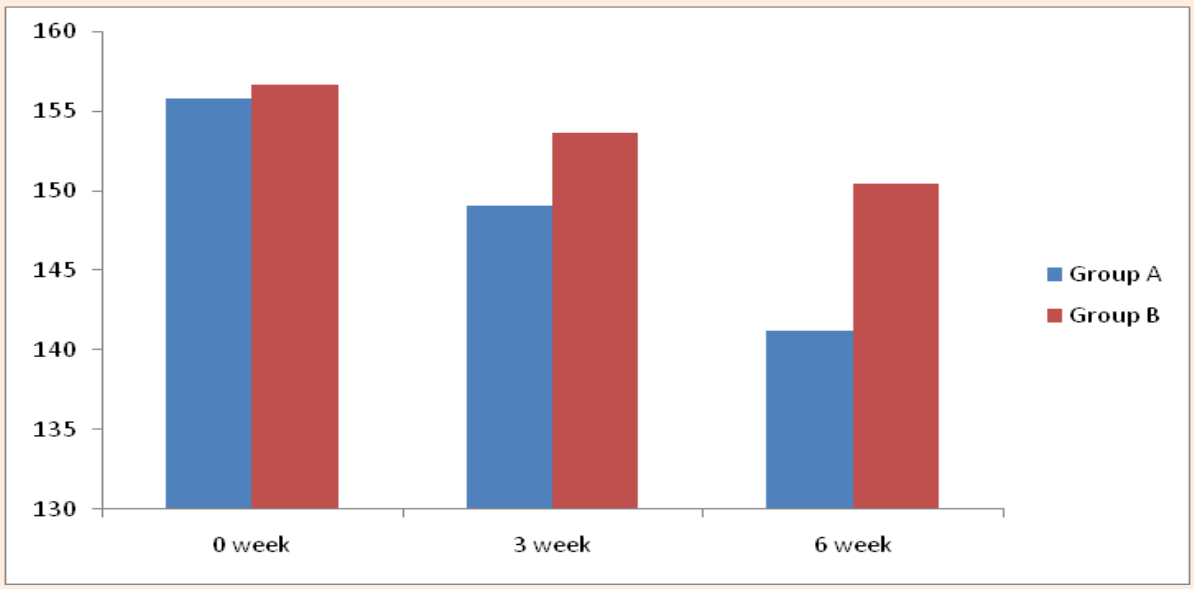
Groups	Weeks	Mean ± SD	t- value	p- value
Group A	0 week	155.87 ± 8.55	19.17	0.001**
	3 week	149.07 ± 8.71		
	3 week	149.07 ± 8.71	24.45	0.001**
	6 week	141.20 ± 8.41		
	0 week	155.87 ± 8.55	25.9	0.001**
	6 week	141.20 ± 8.41		
Group B	0 week	156.73 ± 8.37	12.35	0.001**
	3 week	153.67 ± 8.54		
	3 week	153.67 ± 8.54	12.22	0.001**
	6 week	150.47 ± 8.27		
	0 week	156.73 ± 8.37	14.19	0.001**
	6 week	150.47 ± 8.27		

*Significant at $p \leq 0.025$

**Highly significant at $p \leq 0.001$ NS: Non significant

CHANGES IN SBP SCORE

The mean ± SD of SBP score for patients in Group A on baseline, 3rd and 6th week was 155.87 ± 8.55, 149.07 ± 8.71 and 141.20 ±8.41 respectively (Table 1 and Graph 1). Within group analysis revealed that there was highly significant reduction in SBP score in Group A ($p < 0.001$) (Table 1).



Graph 1: Changes of SBP in Group A and Group B.

The mean ± SD of SBP score for patients in Group B on baseline, 3rd and 6th week was 156.73 ± 8.37, 153.67 ± 8.54 and 150.47 ± 8.27 respectively (Table 1 and Graph 1). Within group analysis revealed that there was highly significant reduction in SBP score in Group B ($p < 0.001$) (Table 1). Between Group analysis showed that a significantly reduction in SBP score was observed in Group A at the end of 6th week as compared to that in Group B ($p \leq 0.025$) (Table 2 and Graph 1).

CHANGES IN DBP SCORE

The mean ± SD of DBP score for patients in Group An on gauge, third and sixth week was 94.73 ± 3.63, 91.13 ± 3.39 and 85.20 ± 3.78 separately (Table 3 and Graph 2). Inside gathering examination uncovered that there was exceptionally critical decrease in DBP score in Group A ($p < 0.001$) (Table 3). The mean ± SD of DBP score for patients in Group B on pattern, third and sixth week was 94.93 ± 3.67,93.00 ± 3.66 and 88.46 ± 3.29 individually (Table 3 and Graph 2). Inside gathering investigation uncovered that there was profoundly critical decrease in DBP score in Group B ($p < 0.001$) (Table 3). Between Group investigation indicated that a fundamentally decrease in DBP score was seen in Group A toward the finish of sixth week when contrasted with that in Group B ($p \leq 0.025$) (Table 4 and Graph 2).

Table 2: Comparison of SBP between Group A and Group B.

Weeks	Group A	Group B	t- value	p- value
	Mean ± SD	Mean ± SD		
0	155.87 ± 8.55	156.73 ± 8.37	0.28	0.78^{NS}
3	149.07 ± 8.71	153.67 ± 8.54	1.45	0.15^{NS}
6	141.20 ± 8.41	150.47 ± 8.27	3.03	0.005*

*Significant at p ≤ 0.025 **Highly significant at p ≤ 0.001 NS: Nonsignificant

Table 3: Changes of DBP within Group A and Group B.

Groups	Weeks	Mean ± SD	t- value	p- value
Group A	0 week	94.73 ± 3.63	7.72	0.001**
	3 week	91.13 ± 3.39		
	3 week	91.13 ± 3.39	11.39	0.001**
	6 week	85.20 ± 3.78		
	0 week	94.73 ± 3.63	13.69	0.001**
	6 week	85.20 ± 3.78		
Group B	0 week	94.93 ± 3.67	3.65	0.003*
	3 week	93.00 ± 3.66		
	3 week	93.00 ± 3.66	6.71	0.001**
	6 week	88.46 ± 3.29		
	0 week	94.93 ± 3.67	9.78	0.001**
	6 week	88.46 ± 3.29		

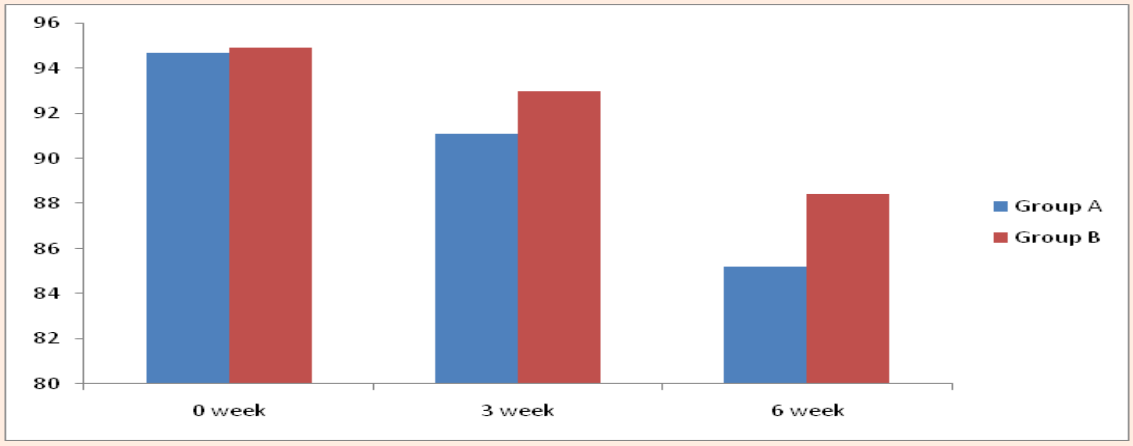
*Significant at p ≤ 0.025

**Highly significant at p ≤ 0.001 NS: Non significant

Table 4: Comparison of DBP between Group A and Group B.

Weeks	Group A	Group B	t- value	p- value
	Mean ± SD	Mean ± SD		
0	94.73 ± 3.63	94.93 ± 3.67	0.14	0.88^{NS}
3	91.13 ± 3.39	93.00 ± 3.66	1.44	0.15^{NS}
6	85.20 ± 3.78	88.46 ± 3.29	2.52	0.017*

*Significant at $p \leq 0.025$ **Highly significant at $p \leq 0.001$ NS: Nonsignificant



Graph 2: Changes of DBP in Group A and Group B.

CHANGES IN HR SCORE

The mean ± SD of HR score for patients in Group An on benchmark, third and sixth week was 85.26 ± 6.32, 83.20 ± 5.89 and 77.93 ± 4.74 separately (Table 5 and Graph 3). Inside gathering examination uncovered that there was profoundly huge decrease in HR score in Group A ($p < 0.001$) (Table 5). The mean ± SD of HR score for patients in Group B on benchmark, third and sixth week was 87.06 ± 7.11,85.60 ± 6.64 and 82.13 ± 4.98 individually (Table 5 and Graph 3). Inside gathering examination uncovered that there was profoundly huge decrease in HR score in Group B ($p < 0.001$) (Table 5). Between Group examination indicated that an altogether decrease in HR score was seen in Group A toward the finish of sixth week when contrasted with that in Group B ($p \leq 0.025$) (Table 6 and Graph 3).

Table 5: Changes of HR within Group A and Group B.

Groups	Weeks	Mean ± SD	t- value	p- value
Group A	0 week	85.26 ± 6.32	3.41	0.004*
	3 week	83.20 ± 5.89		
	3 week	83.20 ± 5.89	7.67	0.001**
	6 week	77.93 ± 4.74		
	0 week	85.26 ± 6.32	12.41	0.001**
	6 week	77.93 ± 4.74		
Group B	0 week	87.06 ± 7.11	2.7	0.017*
	3 week	85.60 ± 6.64		
	3 week	85.60 ± 6.64	6.5	0.001**
	6 week	82.13 ± 4.98		
	0 week	87.06 ± 7.11	6.61	0.001**
	6 week	82.13 ± 4.98		

*Significant at $p \leq 0.025$

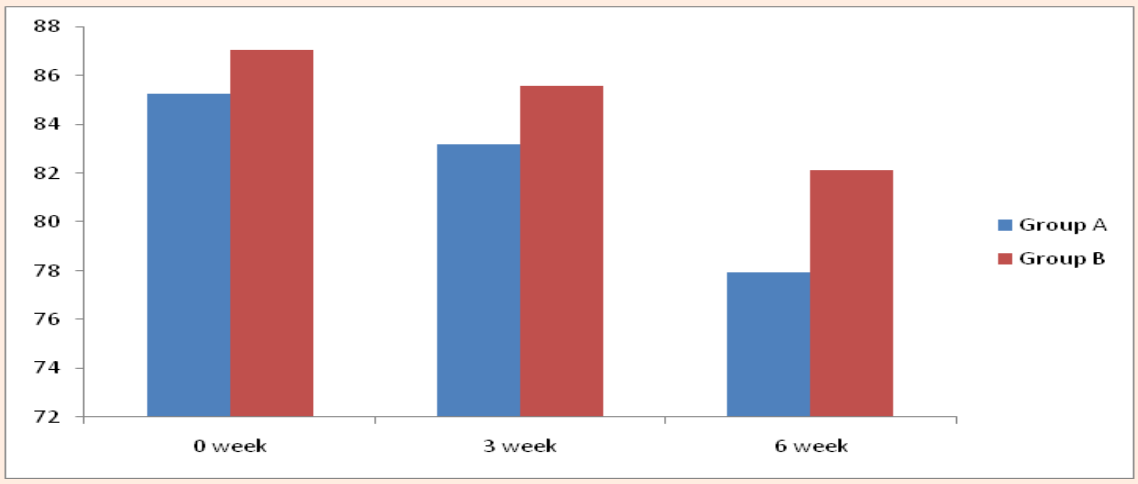
**highly significant at $p \leq 0.001$ NS: Non significant

Table 6: Comparison of HR between Group A and Group B.

Weeks	Group A	Group B	t- value	p- value
	Mean ± SD	Mean ± SD		
0	85.26 ± 6.32	87.06 ± 7.11	0.73	0.47^{NS}
3	83.20 ± 5.89	85.60 ± 6.64	1.04	0.30^{NS}
6	77.93 ± 4.74	82.13 ± 4.98	2.36	0.025*

*Significant at $p \leq 0.025$

**Highly significant at $p \leq 0.001$ NS: Nonsignificant



Graph 3: Changes of HR in Group A and Group B.

DISCUSSION

The new Joint National Committee on counteraction, recognition, assessment and treatment of hypertension suggested that ideal pulse levels ought to be under 120/80 mmHg for resting systolic and diastolic circulatory strain [12]. Actual work is suggested as anticipation, treatment and control of all phases of hypertension. The administration of hypertension is viewed as a need objective in essential and optional anticipation of cardiovascular sickness. A vigorous exercise is an expansion in oxygen utilization and pulse that matches the force of the forced action and a curvilinear expansion in stroke volume while opposition preparing offers more noteworthy advancement of strong strength, perseverance and mass. The same number of relaxation and word related assignments require static or dynamic endeavors. Along these lines, the pressing factor reaction to obstruction practice is generally relative to the percent of maximal intentional compression just as the bulk in question. Expanded muscle strength brings about a weakened pulse and circulatory strain reaction to any heap on the grounds that the heap speaks to a lower level of maximal intentional constriction [13].S R Collier et al. [12] found the effect of four weeks of aerobic and resistance exercise training on arterial stiffness, blood flow and blood pressure in pre-hypertension and stage 1 hypertensive found that resistance exercise resulted in increased arterial stiffness whereas aerobic exercise training decreased arterial stiffness in individuals with pre-hypertensive to essential hypertension despite similar reductions in blood pressure [12]. Jen Chen et al. [14] found the effect of regular endurance exercise training on blood pressure and quality of life in patients with hypertension and found that low to moderate intensity exercise is effective in lowering blood pressure. When compare the effect of different exercise intensities, low intensity exercise was more effective in lowering blood pressure than was high intensity exercise [14]. The present study compared the effects of aerobic versus resistance training on blood pressure in hypertensive patients. Baseline blood pressure and heart rate was evaluated by Omron digital sphygmomanometer were found to be significantly increased in all the patients included in the study. Results revealed that patients in Group A who received aerobic training for 6 weeks was statistically significant improvement in SBP by 4.36% and 9.41%, DBP by 3.8% and 10.06% and HR by 2.41% and 8.59%. Sambhaji Gunjal et al. [4] found that the effect of aerobic interval training on blood pressure and myocardial function in hypertensive patients and showed significant reduction in blood pressure, improvement in cardiac function, aerobic capacity and reduction of mean heart rate [4]. Meruna Bose et al. [15] found that the effect of short duration aerobic exercise on resting blood pressure and heart rate in pre-hypertensive and stage 1 hypertensive subjects and found that there was significant decrease in values of systolic blood pressure, diastolic blood pressure and heart rate after the 6 weeks of aerobic training in hypertensive individuals. The percentage change in the values were found to be more in men than women and changes was more marked in individuals below 50 years of age than individuals above 50 years of age. This is due to aging changes in the cardiovascular system which is irreversible. The arteries of the heart become thicker, stiffer and less flexible [15]. Similarly, patients in Group B received resistance training also showed a statistically improvement in SBP by 1.95% and 3.99%, DBP by 2.03% and 6.81% and HR by 1.67% and 5.66%. Fabio T Montrezol et al. [16] concluded that the resistance training promotes a reduction in blood pressure and an improvement in muscle strength. Resistance training increased circulating levels of adiponectin and reduced the levels of plasma Intracellular Adhesion Molecule-1. Due to augmentation in catecholamines during resistance training, especially epinephrine. A redistribution of adhesion molecules in the endothelium

occur, since neutrophils and lymphocytes have receptors to catecholamines. And catecholamine elicits expression of specific adhesion molecules and changes in its cytoskeletal organizations then altering its adhesion to endothelial wall. There was improvements in muscle strength in training group ($p< 0.01$) and significant reduction in the systolic blood pressure during the day time in training group was ($p< 0.05$) [16]. J. del Pozo – Cruz et al. [17] found the hypotensive acute effect of a combined resistance and walk based exercise among over 65 year old community dwelling women and found that a single bout of combined resistance and walking based exercise is feasible, safe and effective significantly decreasing the diastolic blood pressure in both post exercise 9% and after post 24 hour post exercise 7%. The decrease in the diastolic blood pressure seems modest. It has been shown that a decrease in blood pressure of at least 2 mmHg is associated with 6% decrease in mortality from stroke and 4% from coronary heart disease [17]. Antonio Paoli et al. [8] found the effects of high intensity circuit training, low intensity circuit training and endurance training on blood pressure and lipoproteins in middle aged overweight men and the main finding of this study was the greater effect on blood lipids improvement of a high intensity circuit compared to a lighter circuit or to an endurance training. Different kinds of circuit showed different effects on blood pressure. Low intensity circuit training more improves systolic blood pressure compared to high intensity training and endurance training while the effect of exercise on diastolic blood pressure was greater in response to high intensity circuit training. Resistance training has long been accepted for developing and maintaining muscular strength, endurance, and power and muscle mass [8]. In synopsis, the aftereffect of our examination uncovered that both treatment procedures were powerful in decreasing systolic pulse, diastolic circulatory strain and pulse yet statically there was huge contrast between both the gatherings toward the finish of sixth week. Thus, the outcome lead us to dismiss the invalid theory in this manner affirming that there will be huge contrast between viability of high-impact and obstruction preparing in lessening circulatory strain in hypertensive patients.

LIMITATION OF STUDY

1. Sample size was small.
2. Study duration was short.
3. Follow-up of aerobic and resistance training was not done.

RELEVANCE TO CLINICAL PRACTICE

The finding of the current investigation recommends that vigorous and obstruction preparing in patients of hypertension prompts decline in circulatory strain. Vigorous exercise is handily done on the ground level by the patients as oxygen consuming activity was not done adequately on treadmill or cycling by the patients of all age. The empowering impact of high-impact and opposition preparing in our investigation proposes that both the preparation have valuable adjunctive mediation in the administration of circulatory strain in patients with hypertension.

CONCLUSION

Aftereffects of the examination indicated that in patients with high-impact and opposition preparing yielded a clinically huge improvement in hypertension. On between Group An and Group B examination there is critical improvement in high-impact preparing when contrasted and obstruction preparing toward the finish of sixth week So, the consequence of the investigation demonstrated that high-impact preparing performed on ground can likewise acquire huge improvement patients with hypertension.

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