Original Article

Effectiveness of aerobic exercise in grade 1 and grade 2 hypertensive's

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Abstract

Aim: To see the effectiveness of Aerobic Exercise training in enhancing Blood Pressure control in Grade 1 and Grade 2 Hypertensive's. **Objectives:** To determine the blood pressure control in patients who are on medications only and who perform aerobic exercise along with the medications. **Procedure:** 60 subjects were collected according to the inclusion and exclusion criteria. Written consent forms were taken from the respective subjects for study. Participants were divided in group 1 and group 2 by simple random sampling for 4 weeks. Group 1 received Aerobic Exercise training along with medications and Group 2 were kept only on medications. Each group received 45 min individual training session 3 times a week. The outcome measure was the Blood Pressure values measured before and after the treatment protocol by a Sphygmomanometer. **Result:** After 4 weeks group 1 showed more reduction in B.P than group 2($p<0.0001$, considered extremely significant). **Conclusion:** This study concludes that Aerobic Exercise along with medications is more effective in reducing B.P than medications only.
Key Words: Hypertension, Aerobic Exercise.

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INTRODUCTION

High blood pressure also called "hypertension," is a serious medical condition. It happens when the force of the blood pumping through your arteries is too strong.[1]When your heart beats, it pushes blood through your arteries to the rest of your body. When the blood pushes harder against the walls of your arteries, your blood pressure goes up[1]. A condition present when blood flows through the blood vessels with a force greater than normal. Also called high blood pressure. Hypertension can strain the heart, damage blood vessels, and increase the risk of heart attack, stroke, kidney problems, and death.[1] Your blood pressure may be different at different times of the day. It is usually higher when you first wake up, after you exercise, or when you are under stress. Having higher blood pressure for short amounts of time is normal. However, when your blood pressure stays high for most of the time, it can cause serious health problems. Uncontrolled Hypertension has been reported to be very common among the general population[2].Kaplan recommended the use of non-pharmacological means, such as aerobic exercises, as effectively as possible so that minimum drug therapy is needed[3]. This may complement the BP lowering effects of anti-hypertensive drugs and thereby reducing the number of doses of drugs required[4].In addition physical exercise is worthwhile since all drugs cost money and may produce side effects.[5] The autonomic nervous system plays an important role in the control of blood pressure. In hypertensive patients, both increased release of, and enhanced peripheral sensitivity to, norepinephrine can be found. In addition, there is increased responsiveness to stressful stimuli[6].In human essential hypertension, volume regulation and the relationship between blood pressure and sodium excretion (pressure natriuresis) are abnormal[6].In most people with established essential hypertension, increased resistance to blood flow (total peripheral resistance) accounts for the high pressure while cardiac output remains normal[7]. Hypertension is also associated with decreased peripheral

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venous compliance[8] which may increase venous return, increase cardiac preload and, ultimately, cause diastolic dysfunction. Pulse pressure (the difference between systolic and diastolic blood pressure) is frequently increased in older people with hypertension. This can mean that systolic pressure is abnormally high, but diastolic pressure may be normal or low a condition termed isolated systolic hypertension.[9]

Blood pressure classification

Category	Systoloic B.P	Diastolic B.P
Normal	120-139 Mm Hg	80-89 Mm Hg
Grade 1	140-159 Mm Hg	90-99 Mm Hg
Grade 2	160-179 Mm Hg	100-109 Mm Hg
Grade 3	>180 Mm Hg	>110 Mm Hg

Some with high blood pressure report headaches (particularly at the back of the head and in the morning), as well as lightheadedness, vertigo, tinnitus (buzzing or hissing in the ears), altered vision or fainting episodes.[10] Blood pressure lowering effects of aerobic exercise have been well documented in the literature[11,12,13,14.] Two previous studies[15,16] have investigated the additive effects of drug therapy on BP reducing effect of physical exercise. Aerobic capacity: It describes the functional capacity of the cardiorespiratory system, (the heart, lungs and blood vessels). Aerobic capacity refers to the maximum amount of oxygen consumed by the body during intense exercises, in a given time frame. It is a function both of cardiorespiratory performance and the maximum ability to remove and utilize oxygen from circulating blood. Aerobic exercises have the following effects on the body which in turn reduces the blood pressure

- Aerobic exercise program enhances the utilization of energy by the muscle.
- Increases cardiac output and myocardial contractility.
- Increases alveolar ventilation and gaseous exchange
- Increases blood flow
- Decreases B.P

The outcome measures used were B.P values measured pre and post treatment by using the Sphymomanometer. Aerobic Exercise Program includes three phases: Warm Up Phase-Helps in preparing the body in the exercises to be performed (5-7 mins). Aerobic exercise period and Cool Down Phase- Helps in bringing the body's vitals to normal after exercise (5-7mins).

MATERIAL AND METHODS

In this study 60 participants (30 people in each group) were selected on the basis of inclusion and exclusion criteria and were divided into two groups including both male and female. A detailed explanation of procedure was given to the patient after which consent was signed.In this study subjects participated from 20 to 60 years from Pimpri chinchwad area. The inclusive criteria was-Age> 20 years and < 60 years, Both Males and females, Patients who are on Anti-hypertensive drugs, Non obese people, Grade 1 and 2 hypertensives. The exclusive criteria was- Age < 20 years and > 60 years, Patients having secondary Hypertension, Grade 3 Hypertensives, Pregnant Women, History of any cardiovascular or neurological impairment, Trauma and musculoskeletal impairment and Handicap. Duration of treatment-4 weeks Frequency of sessions- 3 treatment sessions 45 mins each of per week. Blood Pressure was monitored before starting the treatment program and after the program of 4 weeks was over. Withdrawl Criteria: Participants were withdrawn if they complained of musculoskeletal pain persistently over three sessions or if they showed sign of cardiovascular stress such as dizziness and chest pain during the exercise program. Participants could also withdraw voluntarily at any stage in the two groups. Two groups were made for this study: Group 1(Aerobic exercise group). And Group 2 (Control group-only medications). The Aerobic Exercise training program was: Warm up phase – Duration:5-10 mins. Activities: exercises to hand and legs (Hamstring stretch, quadriceps, pectoral stretch etc), marching at place etc. Aerobic exercise period- Duration:45 mins. Activities: Brisk walking, forward and backward movement of leg, shoulder movements, step up and step down movements, bending movements of leg. Cool down phase –Duration: 5-10 mins. Activities: Stretching exercises to hand and legs (Hamstring stretch, quadriceps, pectoral stretch, marching at place etc.2 sets of each exercise was given. Rest period of 1-2 minute after each exercise set is taken.10-20 reps of each exercise are done. This exercise program was done 3 times per week.

Figure A:

Figure B:

Figure C:

Figure D:

Figure E:

Figure F:

Legend

Figure 1: Aerobic Exercise Training Program to Group 1; **A**: Step up **B**: Shoulder Flexion; **C**: Hip Flexion **D**: Forward bending **E**: Backward bending **E**: Shoulder Abduction

RESULT

The data was managed on excel spread sheet. T-test (paired) used to analyze the difference between the blood pressure improvement within the groups i.e. the exercise intervention group(group A) and the control group(group B). Unpaired T-test was used to analyze the difference between the blood pressure improvement between group A and group B. A significant level of p value ($p<0.0001$) was obtained. According to the data analysis of the study, though the p-value of the reduction in both the systolic and diastolic B.P are <0.0001, but there was more significant reduction in the systolic B.P than the diastolic B.P. The mean value of the difference reduction in systolic B.P in Group A was 14.9, whereas that for diastolic B.P was 8.5. Table 1: Shows statistically significant (p value - <0.0001; t value-8.91) difference between the pre and post blood pressure values in group A by using paired t-test. A difference of 8.91 indicates that aerobic exercise helps in reducing Blood pressure. It shows that there is significant decrease in systolic blood pressure by performing aerobic exercise in grade 1 and grade 2 hypertensives. Table 2: Shows statistically significant (p value - <0.0001; t value-5.47) difference between the pre and post blood pressure values in group B by using paired t-test. A difference of 5.47 and p value <0.0001 indicates that there is slight reduction in the blood pressure levels using the conventional treatment. This shows that with medications only there is slight reduction in blood pressure levels in grade1 and grade 2 hypertensives. Table 3: Shows statistically significant difference, the comaprision between intervention effects of Group A and group B. The p value is <0.0001 and the t-value of systolic is 5.662 and that of diastolic is 3.063.This shows that significant reduction occurs in blood pressure when aerobic exercises are performed with the conventional treatment. The more significant reduction occurs in systolic blood pressure. In Group A, the pre-intervention mean systolic blood pressure was 155.033 and mean diastolic blood pressure was 97.7. After incorporating the aerobic exercise program in these

subjects, the mean systolic blood pressure dropped to 140.067 and the mean diastolic pressure to 97.7. A significant difference can be seen here in terms of reduction in blood pressure. In Group B, the pre mean systolic blood pressure was 158.43 and mean diastolic blood pressure was 97.6.When Blood pressure was measured post 4 weeks without incorporating any physical activity and relying only on medications only, the mean systolic blood pressure dropped to 149.96 and the diastolic mean dropped to 91.5. So this shows that the decrease in blood pressure was less. On comparing the fall in mean blood pressures of group A and group B, a more significant reduction was observed in the intervention group i.e the aerobic activity group and less decrease in the conventional treatment group. Also the statistical data proves this point. The mean systolic blood pressure difference is 14.9 and mean diastolic pressure difference is 8.5.While in group B, the mean systolic difference is 8.4 and diastolic is 6.1

Table 1: Comparision of pre and post intervention B.P values in group A

Group A	Pre	Post	P Value	T-Value	Sd	Result
Systolic	155.06	140.2	<0.0001	21.364	6.48	Significant
Diastolic	97.7	89.2	<0.0001	12.45	6.16	Significant

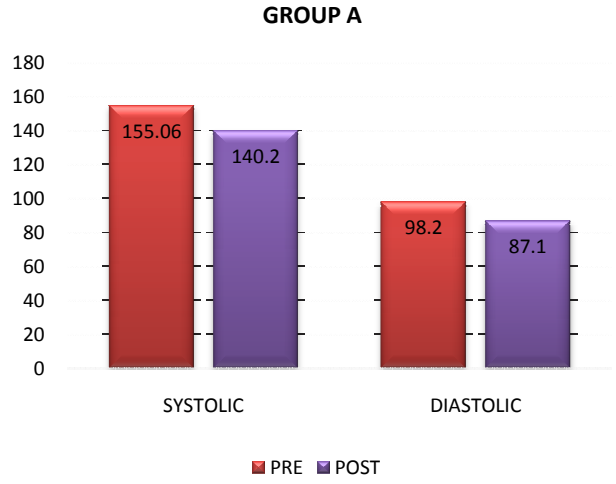

Figure 1: Showing the effectiveness of aerobic exercise training in group a

Table 2: Comparision of pre and post b.p values for conventional treatment in group b

	PRE	POST	PVALUE	TVALUE	SD	RESULT
Systolic	158.4	149.9	<0.0001	9.31	9.62	Significant
Diastolic	97.6	90.5	<0.0001	14.782	5.66	Significant

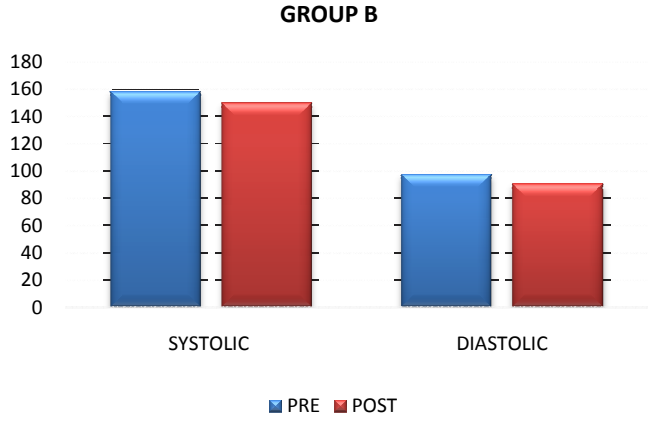

Figure 2: Showing the effectiveness of conventional treatment on group B

Table 3: Comparing the intervention effects of group a and group B on B.P

	Group A	Group B	P Value	T Value	Result
Systolic	14.9	8.4	<0.0001	5.662	Significant
Diastolic	8.5	6.1	0.0033	3.063	Significant

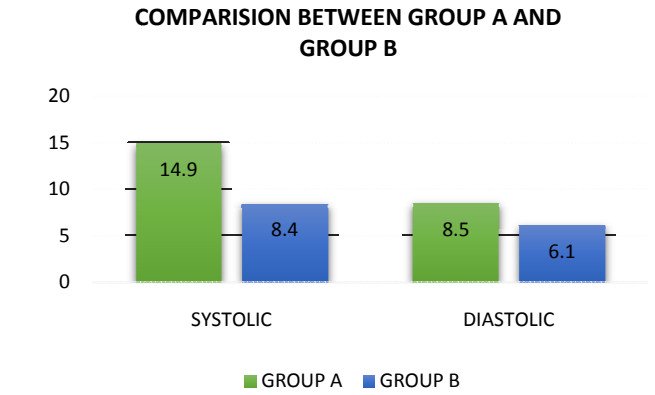

Figure 3: Comparing the effectiveness of aerobic exercises and conventional treatment on systolic and diastolic B.P

DISCUSSION

In this study 60 subjects were chosen on the basis of inclusion and exclusion criteria and were divided into two groups by random sampling method. The outcome measure used were the B.P values measured by using a Sphygmomanometer. The objectives of this study were to determine the possible additive reducing effects of aerobic exercise, as an adjunct or as a part of drug therapy. Apart from reducing effects on B.P, aerobic exercise also has collateral effects on cardiovascular risk factors[13] and thereby reducing the risk of target organ damage. Based on this study there was more significant reduction in systolic B.P as compared to diastolic B.P. B.P control rate tended to be higher in the exercise group than the control group after the 4 week intervention program. It is important to distinguish between the individual and public health implications of our findings. The blood pressure reduction that we observed may be of moderate interest to practitioners treating individual patients. However, a small decrease in the population's average blood pressure level should dramatically reduce incidence of and death from cardiovascular disease in communities[17.] While anti-hypertensive treatment trials have shown that pharmacologic intervention is useful but concerns have also been raised about the potential for delirious side effects of anti-hypertensive drugs. As a result, interest in life style modification i.e. aerobic exercise for treatment and prevention of hypertension has increased. In 2012, investigators from the Dose Response to Exercise in Women trial evaluated the effects of habitual physical activity level in combination with aerobic exercise training on BP[18]. It was reported that changes in BP with aerobic exercise training were not significantly different across tertiles of habitual physical activity[18]. The benefits of exercise have been promoted by a number of organizations and agencies including the American Heart Association, the American College of Sports Medicine, the Surgeon General of the United States, The National Institutes of Health, and the Centers for Disease Control (Wallace, 2003)[19]. Although hypertension studies are ongoing, there is an ample amount of research support that provides clear evidence of the positive effects of exercise on lowering persons with hypertension[19.] Although almost all forms of exercise seem to be effective in reducing blood pressure, aerobic exercise has a significant advantage in terms of a set protocol, the phases i.e. warm up, exercise period and the cool down phase. Thus it has been proved on the basis of this study that aerobic exercise is an important part of the strategy to reduce B.P in grade 1 and grade 2 hypertensives.

CONCLUSION

Aerobic exercises along with medications are more effective in reducing the blood pressure in grade 1 and grade 2 hypertensives than the conventional treatment of only anti-hypertensive drugs.

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