

Original research article

Non-Pharmacological Management of Blood Pressure by Aerobic Training in Hypertensive Indian Patients

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Abstract

Introduction: Hypertension is a non-communicable disease, which is emerging as a major public health problem in the developing countries such as India. According to National Cardiovascular Disease Database, supported by Ministry of Health & Family Welfare, Government of India and World Health Organization, the prevalence of hypertension is gradually raising now a days, which leads to coronary heart disease which constitutes 54.1% of all cardiovascular disease deaths. Lifestyle of an individual such as diet, physical activity, environment etc plays major role in development of hypertension. Physical inactivity is a major risk factor for cardiovascular disease, and persons who are less active and less fit have a greater risk for high Blood pressure. Aim and Objectives: Study aimed to determine the effects of effects of aerobic exercise on blood pressure in patients suffering with pre or stage-1 hypertension.

Material and Method: It is a prospective, cross-sectional and descriptive study. This study was conducted in the Department of Physiology, Malwanchal University over a period of three years. Experimental study design was carried out with a sample of 60 participants in each group of exercises assigned randomly. Following the inclusion and exclusion criteria, informed consent was taken from all the participants included in the study.

Results: After three months aerobic training Mean Systolic Blood Pressure is changed in pre-test 135.65 ± 6.35 mm of Hg to post-test 133.65 ± 6.12 . In aerobic group Mean Diastolic Blood Pressure in pre-test 91.63 ± 5.83 mm of Hg and post-test 87.73 ± 5.33 .

Conclusion: The present study conclude that aerobic exercise training has therapeutic effects in the pre or stage-1 hypertensive patients.

Keywords: Aerobic exercise, Hypertensive patients, Systolic blood pressure, Diastolic blood pressure, Exercise effects.

Introduction

Hypertension is a non-communicable disease, which is emerging as a major public health problem largely in the low- and middle-income countries. According to World Health Organization, the prevalence of hypertension is raised from 594 million in 1975 to 1.13 billion in 2015. [1]

Hypertension is when mean arterial pressure is greater than the upper range of the accepted normal measure. A mean arterial pressure greater than 110 mm Hg (normal is about 90 mm Hg) is considered to be hypertensive. In severe hypertension, the mean arterial pressure can rise up to 150 to 170 mm Hg, with diastolic pressure as high as 130 mm Hg and systolic pressure occasionally as high as 250 mm Hg. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (**JNC-VII report**) has recommended a new classification for adults – 18 years or older. SBP and DBP less than 120 and 80 mmHg is considered as normal blood pressure respectively and SBP 120-139 mmHg or DBP 80-89 mmHg is known as prehypertension. Stage 1 hypertension is when SBP falls between 140-159 mmHg or DBP 90-99 mmHg and more than this i.e. ≥ 160 mmHg SBP, ≥ 100 mmHg DBP is Stage 2 hypertension. [2].

Hypertension is grouped into two main categories. These include primary or essential and secondary hypertension. Primary hypertension affects ninety-five percent of persons suffering from the disease. Secondary hypertension is occurring as a result to a consequence of another disorder such as renal failure or renovascular disease. [3]. The causes of primary hypertension are not yet known, however, Lifestyle of an individual such as diet (high salt intake, low potassium diet), physical activity, environment, age, stress, genes etc have been found as contributing to hypertension. Physical inactivity is a major risk factor for cardiovascular disease, and persons who are less active and less fit have a greater risk for high Blood pressure [4].

Aerobic exercise is defined as “Sub maximal, rhythmic, repetitive, exercise of large muscle groups during which the needed energy is supplied by inspired oxygen” (5). Aerobic exercise is a complex psychobiological stimulus, meaning that repeated exposure to uncontrollable stressors causes the body to eventually become resistant to stress, but with exposure to controllable stress this can be achieved more quickly. Aerobic exercise is considered a controllable stressor that challenges homeostasis by stimulating the sympathetic nervous system to release adrenaline and noradrenaline. [6]

Material and Method

It is a prospective, cross-sectional and descriptive study. Experimental study design was carried out with a sample of 60 subjects of each group clinically diagnosed as stage-1 Hypertension (mild) or pre-hypertension were selected according to inclusion and exclusion criteria. Subject were selected from the OPD of Index medical college and hospital, Indore. All the subjects were explained about the purpose of the study and a brief explanation about the treatment session of aerobic exercise was given to them. Informed Consent was obtained from the subjects.

Inclusion criteria- Either gender with age group of 30-60 years of pre-hypertensive and stage 1 hypertensive subjects according to JNC VIII (Systolic BP 120- 159 mm Hg and Diastolic BP 80-99 mmHg) was included. The inclusive subjects were non-alcoholic and non-smokers.

Exclusion criteria- Patient with secondary hypertension, left ventricular hypertrophy, recent myocardial infarction, three or more risk factors of CVD, mentally unstable or uncooperative patients or patients with history of liver disease, kidney disease and diabetes were excluded.

Results

In this study we have observed that out of the 60 patients, 32 were males and 28 females, which correspond to 53.3% of males and rest of the females and maximum patients were in the age group of 51-60 years as shown in the table no. 1.

Table 1: Demographic profiles

Parameters	Number of patients	Percentage (%)	p-value
Distribution of Gender			
Male	32	53.3	P>0.05
Female	28	46.7	
Age group (in years)			
30-40 years	13	21.6%	P>0.05
41-50 years	21	35.0%	
51-60 years	26	43.3%	

Table 2: Mean Pulse Rate (beats/minute) of aerobic exercise Group

	Aerobic exercise Group Mean \pm SD	p-value
Pre-test	79.43 \pm 4.73	>0.05
Post-test	78.24 \pm 4.43	<0.05

S: Statistically Significant.

It is observed from **Table 2** that, aerobic group pre-test Mean Pulse Rate of 79.43 \pm 4.73 beats/min (Mean \pm SD) remain 78.24 \pm 4.43 in post-test.

Table 3: Mean SBP (mmHg) of Aerobic exercise Group

	Aerobic exercise Group Mean \pm SD	p-value
Pre-test	135.65 \pm 6.35	>0.05
Post-test	133.65 \pm 6.12	<0.05

S: Statistically Significant.

Table 3 shows that Mean Systolic Blood Pressure before starting the aerobic training that is pre-test is 135.65 \pm 6.35 mm of Hg and post-test is 133.65 \pm 6.12 which is statistically significant (p-value <0.05).

Table 4: Mean DBP (mmHg) of Aerobic exercise Group

	Aerobic exercise Group Mean \pm SD	p-value
Pre-test	91.63 \pm 5.83	>0.05
Post-test	87.73 \pm 5.33	<0.05

Table 4 depicts that, in aerobic group Mean Diastolic Blood Pressure in pre-test 91.63 \pm 5.83 mm of Hg and post-test 87.73 \pm 5.33 and it is statistically significant (p-value <0.05).

Discussion

The purpose of this study was to evaluate the effectiveness of aerobics exercises on ambulatory blood pressure in pre- hypertensive and stage-1 hypertension patients. In the present study we have observed that in comparison to the females, males are predominant in hypertension and most of the patients are from the age group of 51-60 years of age. That means, hypertension increase with the age. Aging as a biological process with a decline in the performance of most organs. Less activity as a result to ageing also causes high blood pressure. Impaired ability of the arteries to expand when blood is pumped can be attributed to hardening of the structural changes in the arteries.

This study demonstrated that exercise program among hypertension patients with 12 weeks duration of aerobic exercises were efficacious. After the aerobics training for three months, there is slight decrease in mean pulse rate from pre-test 79.43 ± 4.73 beats/min (Mean \pm SD) to 78.24 ± 4.43 post-test. Reduction in the Mean Systolic (2mm of Hg) and diastolic blood pressure (3.9 mm of Hg) is observed. Aerobic training showed a significant improvement in systolic and diastolic blood pressure (p-value <0.05). A study done by Montero D supported our study. [7]. Various approaches have been used to increase physical activity and maintain adherence. The effectiveness of these methods has been reviewed by Pescatello et al (2019). [9]. Regular exercise positively affects the resistant hypertension and increased sympathetic tone [10]. Due to sports activities NO production increases and augments the endothelium - dependent vasodilation [11].

The consequences of our findings for personal and public health should be distinguished. The drop in blood pressure that we saw may be of mild relevance to doctors seeing certain patients. However, a slight drop in the population's average blood pressure level could significantly lower cardiovascular disease incidence and fatalities in local populations (12).

Study encountered with some limitation like sample size of the study was small, we were not able to get significant results on comparing the variables. Despite vocal attempts to inspire the subjects, lack of motivation restricted the participants to join and/or to be regular for training. Also, it was difficult to manage the psychological aspects, eating habits, rest and sleep times, lifestyle choices, etc.

Conclusion

In conclusion, our findings point to aerobic exercise as a critical strategy for both the prevention and management of high blood pressure. We are aware of the challenges in conducting experimental study on various patients. But in our study, the blood pressure drop brought on by aerobic exercise was of greater significance in central Indian population, hence, will be very helpful to enhance the therapeutic effects of the hypertension treatment.

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