International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Isometric Exercise and Inspiratory Muscle Training as the Antihypertensive Treatment in Elderly Population

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ABSTRACT:

BACKGROUND: Hypertension is a common age related, chronic disorder affecting more than 1 billion people. The risk of developing hypertension is between the age of 55 to 65 years. Inspiratory muscle training (IMT) and isometric resistance training individually shows beneficial outcomes in a number of cardiovascular populations, which may potentially improve condition of elderly patients with hypertension.

PURPOSE: To study the effectiveness of combined isometric resistance training and inspiratory muscle training on the change in blood pressure.

METHODS: A total of 15 patients were included in the study based on the inclusion who werediagnosed with hypertension above 140/70 mmHg, both genders with age above 60 years, andthe patients with any acute illness and other neurological, metabolic, pulmonary and systemicdiseases were excluded from the study. All the participants were assessed for SBP and DBP before initiating the study using sphygmomanometer. All the participants were given isometricexercises and inspiratory muscle training for 3 weeks and the post-test measurements were obtained. The pre-test and post-test measurements were statistically analysed.

RESULTS: The study shows a statistically significant difference between the pre-test and post -test value of SBP (-8.47 mmHg) and DBP (-3.2mmHg) with p value <0.0001.

CONCLUSION: Our findings and data suggest that this form of training has the potential to produce significant and clinically meaningful blood pressure reductions in the elderly population.

KEYWORD: Isometric exercises blood pressure, Inspiratory muscle training.

INTRODUCTION:

Hypertension, or high blood pressure is a long-term elevation of resting arterial bloodpressure above 140 mm Hg systolic (SBP) and/or 90 mm Hg diastolic (DBP) blood pressure. It is a major risk factor for cardiovascular morbidity and mortality. In severe cases it may lead to organ damage and the development of heart, kidney and liver failure. Hypertension is primarily treated by pharmacologic management but recently, non-pharmacologic interventions on blood pressure management have been found and proved effective. This non- pharmacological treatment is not the replacement of hypertensive drugs but rather an adjunct to stabilize the blood pressure with low doses of hypertensive drugs. (1)

High blood pressure, is a major health problem that is more common in the elderly population. As the

body age the blood vessels or the vascular system, gets stiffer, causing the blood pressure to go up. The prevention and control of high blood pressure is important not only for the health of the heart but also for the benefit of the brain health as well. The long- term studies of adults over the age of 55 found that treating high blood pressure was associated with a reduction in the risk of developing Alzheimer's disease[5]. The factors affecting hypertension are the age, gender, family history, race, weight, excessive alcohol consumption sedentary lifestyle, higher salt intake, sleep, active smoking, pregnancy, stress anxiety etc. [6]

The common complications in cardiovascular system resulted by hypertension are myocardial ischemia, atherosclerosis, left ventricular hypertrophy, abnormal dilatation of aorta, etc. Hypertension also affects other systems of the body including nervous system. Some of the neurological conditions are stroke, tinnitus, severe vertigo, cerebral crises and apoplecticseizures. Renal impairment is one the complications of hypertension as the arteries around the kidneys starts to narrow, weaken or harden because of the uncontrolled high blood pressure and hampers the blood filtration property and are unable to deliver enough blood to the kidney tissue. The mild to moderate hypertensive retinopathy is also common and might be asymptomatic whereas symptoms of more severe and accelerated hypertension might include headaches and vision problems [10].

The international treatment guidelines for primary and secondary prevention of hypertension recommended exercises and lifestyle modifications as the first line of therapy, including increasing levels of physical activity. The important factor that affects the effectiveness to lower BP is the type of exercise performed. Recent analyses suggest that isometric exercise may elicit BP reductions greater than those seen with dynamic aerobic and resistance exercise. Isometric exercise elicits sustained contraction against an immovable resistance with no or minimal change in length of the involved muscle group [4]. Isometric activity i.e., of low and moderate intensity requires relatively inexpensive equipment, and does not produce the same level of cardiovascular stress as aerobic activity. Isometric exercise has more adherence due to simplicity, lower cost, and perhaps less exercise time. [1]

The previous studies and investigation have reported autonomic cardiovascular control alterations with different breathing patterns, that has a ventilatory influence on hemodynamic.

Breathing exercises and respiration control are a viable treatment option for hypertension with a more favourable side effect compared to pharmacology [2]. Even without an imposed external resistance there is a resultant reduction in respiratory rate that lowers blood pressure (BP) by favourable modulation of cardiovascular reflexes. Inspiratory muscle training (IMT), which does impose an external resistance to the respiratory musculature, has demonstrated beneficial training effects in patients with cardiovascular disease, specifically in patients with chronic heart failure [2]

The purpose of this study was to find the combined effect of isometric exercise and inspiratory muscle training exercises in hypertensive patient among elderly population.

METHODS:

Based on the inclusion and exclusion criteria this study was conducted among 15 elderly patients from Divine grace ayurvedic and physiotherapy clinic, Bengaluru. The inclusion criteria for the participants are the patients who were diagnosed of hypertension and are under continuous medication with age over 60 years with blood pressure above 140/70 mmHg. The acquired patients for the studies were both male and female. The exclusion criteria for this study were patients with any acute illness and other neurological, metabolic, pulmonary and systemic diseases. The research program was done with the

approval from the institutional ethical committee. The subjects in the research were informed about the study's objective, procedures, benefits, and potential risks before participation. Afterward, the informed consent form was signed by all the participants. The systolic BP and diastolic BP of all participants were assessed using the sphygmomanometer before initiating the study. The participants were allowed to discontinue the experiment according to their will. During the studies the participants were given isometric hand grip exercises, isometric leg exercises and inspiratory muscle training with the help of incentive spirometer. Initially the subjects are taught the correct breathing pattern and spirometers were introduced to them.

Training protocol: The sessions were administered for a total of 3 weeks, 5 times per week. each session lasted for about 25 minutes. The inspiratory muscle training was given for total 5 minutes, with rest period of 30 second in between each minute [(2)]. After that the subjects were given 3 sets of isometric hand grip exercise for 2 minutes, with the rest time of 1 minutes in between the sets followed by 3 sets of isometric leg exercises for 2 minutes, with 1 minutes of rest in between. [(1)]

RESULT:

In our studies 15 elderly patient was given inspiratory muscle training using incentive spirometer followed by isometrics hand grip exercise and leg exercise. The blood pressure reading was taken using sphygmomanometer before and after the research. In systolic blood pressure the mean difference between the pre and post exercise was 8.47 with t-value of 13.92 whereas for the diastolic blood pressure the mean difference was 4.07 with the t-value of 16.39 and the p- value <0.0001. The decrease in systolic blood pressure was more prominent compared to the diastolic blood pressure.

PARAMETERS	TESTS	GROUP	MEAN	SD	t-VALUE	p-VALUE
BLOOD PRESSURE MEASUREMENT (WITH SPHYGMOMANOMETER)	SYSTOLIC BLOOD PRESSURE	PRE-TEST	177.60	11.86	13.92	<0.0001
		POST-TEST	169.13	12.48		
	DIASTOLIC BLOOD PRESSURE	PRE-TEST	84.87	9.61	16.39	
		POST-TEST	80.80	9.61		

DISCUSSION:

The above finding showed that combining isometric and breathing exercise improved and stabilized the blood pressure. The subjects who were on medication continued their medication during this research program.

According to Debra J. Carlson *et al*, the result obtained from the study shows that the SBP mean difference (MD), -6.77 mm Hg (95% CI, -7.93 to -5.62 mm Hg. They concluded in their studies that isometric exercises has the potential to significantly reduce the blood pressure and can be used as an adjunctive exercise modality[(1)].

The study by Janaína Barcellos Ferreira et al, has shown that there was a significant increase in

inspiratory muscle strength in the IMT group (82.7±28.8 vs 121.5± 21.8 cmH2O, Pb0.001), which was not demonstrated by P-IMT (93.3±25.3 vs 106.1±25.3 cmH2O, PN0.05).). They concluded with the significance of inspiratory muscle training and their beneficial effect on thehypertension [(2)].

CONCLUSION:

According to this research, combining isometric exercise and inspiratory muscle training program has the ability to reduce the resting blood pressure and act as antihypertensive treatment in the elderly. The simplicity, low equipment of this exercise provides enhanced exercise adherence in the elderly population.

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