

EFFECT OF DURATION OF PHYSICAL ACTIVITY ON HYPERTENSION AMONG NORTH INDIAN POPULATION

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ABSTRACT

When it comes to disease load and causes of death, hypertension (HTN) is the third leading cause of death worldwide. Regular aerobic exercise dramatically decreases blood pressure in people with essential hypertension, according to randomized, well-controlled exercise intervention studies. Exercise is a key component of the lifestyle changes that are recommended for the prevention, treatment, and control of HTN. For the primary prevention, treatment, and control of HTN, exercise continues to be a cornerstone therapy. Both hypertensives and normotensives in the current study population who engaged in physical activity for 30 minutes a day reported lower blood pressure compared to those who exercised irregularly, regardless of the amount of time or intensity spent exercising.

A cross-sectional approach was applied to study 308 HTN patients (159 males and 149 females) in addition to 101 age and sex-aligned healthy controls (non-hypertensives) within the age range of 40–70 years. A questionnaire was filled out by the participants about how long they exercised and was depicted in the form of a table in percentage.

A 12.1% of the hypertensive females, 27% of hypertensive males, 19.6% control males, and 10% of the normal females exercise for one hour while 1.3% of the hypertensive females, 0.6% hypertensive males, 3.9% control males, and 2% control females exercise for two hours. A 35.6% of the hypertensive females, 30.8% of hypertensive males, 37.3% of control males, and 46% of the normal females exercise for only 30 minutes. Out of the total population 18.6%, 1.5%, and 35.2% of subjects exercise for one hour, two hours, and 30 minutes respectively.

A more regulated BP was reported among the present study population

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performing physical activity for 30 minutes per day among both hypertensives as well as normotensives as compared to those performing exercise on an irregular basis irrespective of the time and intensity of the exercise performed.

Keywords: *Cross-sectional study, hypertension, physical activity, percentage.*

INTRODUCTION

Hypertension is one of the significant factors in dementia, chronic renal disease, and cardiovascular and cerebrovascular diseases, as well as one of the leading causes of morbidity and mortality worldwide (Quang *et al.*, 2013; Chobanian *et al.*, 2003). India is a major contributor to a significant portion of the global burden of hypertension, which is steadily increasing (GBD, 2016). Lifestyle factors have been linked to hypertension for a while, but over the past 20 years, observational and experimental research has dramatically increased understanding of their relative importance, processes, and potential for use as therapies (Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure, 1997).

Physical activity is defined as any skeletal muscle-produced movement of the body that causes an energy expenditure over the baseline level (Caspersen, *et al.*, 1985). By engaging in regular physical activity, one can increase flexibility, muscular strength, and stamina (Kaplan *et al.*, 2001]. Exercise has a connection to controlling weight, and it will also aid in controlling hypertension. Numerous studies have demonstrated that increasing physical activities like jogging, cycling, and swimming can lower blood pressure (Hu *et al.*, 2004). Weight loss helps hypertensives and normotensives lower their blood pressure, according to several clinical trials (Diaz, 2002). One of the studies showed that yoga was the most powerful weapon to fight hypertension.

Whether age and/or gender affect how exercise training affects high blood pressure (BP) is a significant unresolved issue. Regarding the impact of age, findings from a meta-analysis show that middle-aged hypertension participants appear to experience a higher reduction in blood pressure than either their younger or older counterparts (Hagberga and Brown, 1995). Despite considerable interest in non-pharmacological treatments for hypertension, the effectiveness and mechanisms of physical activity as a treatment for hypertension have not been widely accepted (WHO/ISH, 1983). Exercise has regularly been shown to have positive benefits on hypertension, resulting in drops in both systolic and diastolic blood pressure of up to 5- 7 mmHg. Regular exercise may lead to better-prolonged blood pressure reduction and control (Pescatello, 2005).

Modern society's growing urbanization has resulted in significant behavioral shifts, particularly a rising trend towards sedentary lifestyles. According to estimates, children today burn 600 fewer calories per day through physical exercise than children did 50 years ago (Boreham and Riddoch, 2001.). But there is undeniable proof that there is an inverse dose-response relationship between total exercise volume and intensity and cardiovascular mortality, both

in healthy people and in people with cardiovascular disease (CVD) (Sesso, *et al.*, 2000).

It is widely acknowledged that consistent aerobic exercise lowers blood pressure (BP) in this population (Tanaka *et al.*, 1999). The World Health Organization (1999) and the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (1997) both suggest that people with essential hypertension engage in regular aerobic activity as the first step in changing their lifestyle.

How much exercise is required to lower BP is a crucial subject for people with an interest in the relationship between physical activity and hypertension. Each adult should engage in at least 30 minutes of moderate physical activity most days of the week, according to a consensus statement on physical activity recommendations that is currently accessible (Pate *et al.*, 1995).

MATERIALS AND METHODS

The present cross-sectional study was carried out on hypertensive patients residing in Northwestern India. Data were collected from hypertensive patients who visited the Jain Clinic, at Sector 21, Chandigarh. A sample of 308 hypertensive patients comprising men (n=159) and women (n=149) aged 40-70 years were selected for the study. Two different groups were formed Control/Experimental and Test/Cases. The objective of this study was to assess hypertensive patients according to their exercise duration. It was assessed using a self-designed questionnaire filled out by the subjects. Subjects with almost similar age ranges and no clinical evidence of hypertension were recruited as controls (n=101 with 51 males and 50 females).

To construct a scholarly and organized assessment of the literature, a number of books and search engines were examined, including PubMed, Medline, ScienceDirect, SCOPUS, and Google Scholar. A thorough literature search was done to find current and trustworthy data for the analysis. A specific term was utilized to locate publications that were connected to the analysis. In order to establish a clear design for the research challenge, secondary data from the patients were used. The study's goals and objectives were significantly influenced by the literature review.

Essential Hypertension (EH) is a major public health issue that affects people all over the world, including India. According to recent data on EH in the population of Chandigarh (India's Union Territory and the capital of the Punjab and Haryana States), the prevalence of EH in Chandigarh citizens has doubled in the last 30 years (26.9 to 45.80 % in the year 1968 and 2002) (Taneja and Mandal, 2007).

Inclusion criteria: Only confirmed hypertensive patients of (n=308) aged between 40-70 years comprising males and females who arrived for treatment at Jain Clinic, Sector 21, Chandigarh were included. Patients having a history

of hypertension for the past five years with or without diabetes and cardiovascular disease were included with their proper consent.

Exclusion criteria: Patients with acute morbidity such as elevated body temperature, respiratory, and gastrointestinal problems, kidney problems, wounds, and infections with other chronic diseases were excluded. Patients that were not ready to give consent were also excluded from the study.

Ethical clearance: Clearance for collecting data from subjects was approved by the Ethical Committee of Panjab University, Chandigarh via letter no. PUIEC/2018/95/95-A/09/01, Dated: 09/04/2018.

Lifestyle: A questionnaire was filled by the participants about how long do they exercise.

Statistical Analysis

The raw data were entered into a Microsoft Excel spreadsheet and subjected to statistical investigation using SPSS version 28 and the final results were shown in the form of tables and figures. Statistical test like percentage was applied and analyzed on the collected data.

RESULTS

Here, the data analysis, tabular and graphical findings representations, and interpretation of the study's observations are covered. The primary sources of data were hypertensive patients who visited the Jain clinic in Sector 21 of Chandigarh and volunteers who were used as controls and who had no clinical signs of hypertension.

A total number of 409 subjects (both hypertensives and non-hypertensives) were included in the study. The subjects were categorized into two groups i.e., Case (Hypertensive patients) and Control (Normal subjects) groups.

1.1 Comparison of How long the subjects exercise–Among hypertensive and control groups.

- 1.2 How long the subjects exercise has been depicted in Table-1 and Figure-1. 35% of the hypertensive group and 24.6% of the normal group subjects exercised for one hour while 1.8% of the hypertensive group and 5.3% of the normal group exercised for two hours and 56.4% of the hypertensive group and 70.2% of the normal group exercised for 30 minutes (Figure-1).

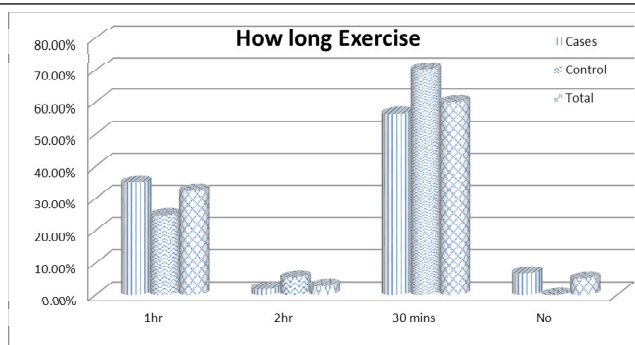


Figure-1: Comparison of How long the subjects exercise–Among hypertensive and control groups.

1.3 Comparison of How long the subjects exercise–Among hypertensive and control groups (Sex wise).

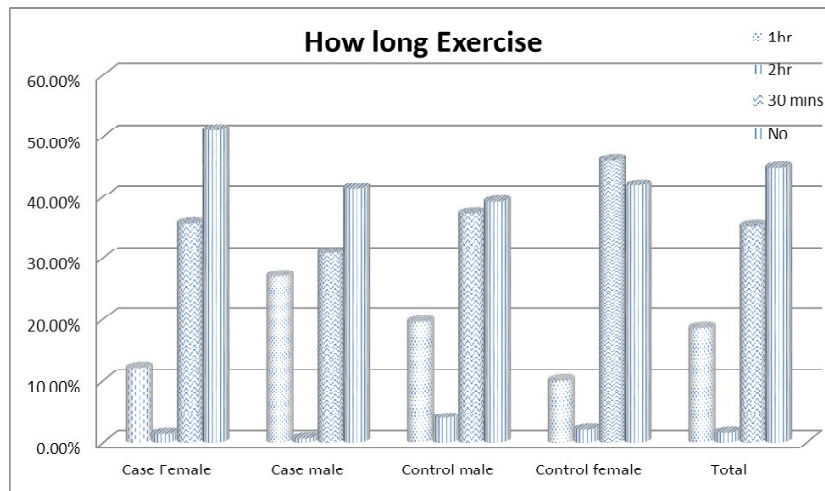
Table-2 depicts the distribution frequencies of how long the subject exercise. 12.1% of the hypertensive females, 27% of hypertensive males, 19.6 control males, and 10% of the normal females exercise for one hour while 1.3% of the hypertensive females, 0.6% hypertensive males, 3.9% control males, and 2% control females exercise for two hours. 35.6% of the hypertensive females, 30.8% of hypertensive males, 37.3% of control males, and 46% of the normal females exercise for only 30 minutes. Out of the total population 18.6%, 1.5%, and 35.2 % subjects exercise for one hour, two hours, and 30 minutes respectively (Figure-2).

Table-1: Comparison of How long the subjects exercise–Among hypertensive and control groups.

| | | | Group | | Total |
|-------------------|----------------------------|----------------------------|--------|--------|--------|
| | | | Cases | Normal | |
| how long exercise | One hour | Count | 57 | 14 | 71 |
| | | % within how long exercise | 80.3% | 19.7% | 100.0% |
| | | % within group | 35.0% | 24.6% | 32.3% |
| | Two hour | Count | 3 | 3 | 6 |
| | | % within how long exercise | 50.0% | 50.0% | 100.0% |
| | | % within group | 1.8% | 5.3% | 2.7% |
| | 30 minutes | Count | 92 | 40 | 132 |
| | | % within how long exercise | 69.7% | 30.3% | 100.0% |
| | | % within group | 56.4% | 70.2% | 60.0% |
| | No | Count | 11 | 0 | 11 |
| | | % within how long exercise | 100.0% | 0.0% | 100.0% |
| | | % within group | 6.7% | 0.0% | 5.0% |
| Total | Count | 163 | 57 | 220 | |
| | % within how long exercise | 74.1% | 25.9% | 100.0% | |
| | % within group | 100.0% | 100.0% | 100.0% | |

Table-2: Comparison of How long the subjects exercise–Among hypertensive and control groups, according to sex.

| | | | Group | | | | Total |
|-------------------|----------------------------|----------------------------|-------------|-----------|--------------|----------------|--------|
| | | | Case Female | Case male | Normal males | Control Female | |
| how long exercise | One hour | Count | 18 | 43 | 10 | 5 | 76 |
| | | % within how long exercise | 23.7% | 56.6% | 13.2% | 6.6% | 100.0% |
| | | % within Group | 12.1% | 27.0% | 19.6% | 10.0% | 18.6% |
| | | Count | 2 | 1 | 2 | 1 | 6 |
| | Two hour | % within how long exercise | 33.3% | 16.7% | 33.3% | 16.7% | 100.0% |
| | | % within Group | 1.3% | 0.6% | 3.9% | 2.0% | 1.5% |
| | | Count | 53 | 49 | 19 | 23 | 144 |
| | | % within how long exercise | 36.8% | 34.0% | 13.2% | 16.0% | 100.0% |
| | 30 minutes | % within Group | 35.6% | 30.8% | 37.3% | 46.0% | 35.2% |
| | | Count | 76 | 66 | 20 | 21 | 183 |
| | | % within how long exercise | 41.5% | 36.1% | 10.9% | 11.5% | 100.0% |
| | | % within Group | 51.0% | 41.5% | 39.2% | 42.0% | 44.7% |
| No | Count | 149 | 159 | 51 | 50 | 409 | |
| | % within how long exercise | 36.4% | 38.9% | 12.5% | 12.2% | 100.0% | |
| | % within Group | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | |
| | Total | | | | | | |

**Figure-2: Comparison of How long the subjects exercise–Among hypertensive and control groups, according to sex**

DISCUSSION

Objective 4: To evaluate whether the duration of exercise has any effect on hypertension.

Coronary heart disease, stroke, congestive heart failure, renal failure, and peripheral vascular disease are all significantly influenced by hypertension (Pescatello *et al.*, 2004). It is widely acknowledged that consistent aerobic exercise

lowers blood pressure (BP) in this population (WHO/ISH, 1983). Despite recent developments in medicine, hypertension continues to be the main indicator of cardiovascular disease (CVD), making it a significant public health concern. All around the world, especially among Indians, the prevalence of hypertension is increasing rapidly.

Numerous studies show the value and efficiency of physical activity in lowering the risk of developing hypertension as well as in lowering blood pressure during treatment therapy for those who have been diagnosed with hypertension (Physical Activity Guidelines Advisory Committee, 2008; Fagard, 2005.). Epidemiological studies have shown that physical activity and blood pressure have an inversely proportional relationship, with an increase in physical activity reducing the incidence of incident hypertension by about 15%. Clinical studies show that persistent dynamic aerobic endurance training can reduce pre-hypertensives', hypertensives', and normotensives' ambulatory blood pressure as well as their resting blood pressure (Whelton *et al.*, 2002; Cornelissen and Fagard, 2005; Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 1997.).

Based on the goals of the current study, an assessment of the risk of hypertension along with lifestyle interventions like exercise needed to slow the pace of hypertension among the North Indian population has been done. Both hypertensives and normotensives in the current study population who engaged in physical activity for 30 minutes a day reported lower blood pressure compared to those who exercised irregularly, regardless of the amount of time or intensity spent exercising. In patients with stage 1 or stage 2 essential hypertension, even 30 to 60 minutes of exercise per week was adequate to lower both systolic and diastolic blood pressure. (Ishikawa-Takata *et al.*, 2003). Specifically, the reduced risk of coronary heart disease seen in even these mild exercisers in the epidemiologic study (Lee *et al.*, 2001) may be attributed, at least in part, to its effects on blood pressure as shown in our current study because of the positive correlation between BP levels and the incidence of coronary heart disease. Exercise has been successfully implemented into multi-component lifestyle therapies (such as weight loss, dietary changes, and physical activity) together with other suggestions to reduce blood pressure (Reid *et al.*, 1994). It is unknown how exercise affects blood pressure. One idea holds that exercise enhances endothelial function. The endothelium lining of blood vessel walls maintains appropriate vasomotor tone, improves blood fluidity, and controls vascular growth (Sherman, 2000).

It seems best to engage in moderate-intensity exercise (50-65% of maximal heart rate) most days of the week for at least 30 to 60 minutes. Walking quickly is moderate; jogging or running is vigorous. When combined with aerobic exercise, resistance training can help maintain and increase muscle mass, especially in aging bodies (American College of Sports Medicine, 2004).

According to one study, there was a 39.39% prevalence of hypertension in

sedentary individuals. It was 55.10% for subjects with light physical activity, 20.69% for those who were moderately active, and 4.92% for those who were actively active. It has been demonstrated that increasing aerobic exercise, such as brisk walking and swimming, lowers blood pressure. The loss of weight has no bearing on this reduction. It is advised that a person exercise at least five days a week for at least 30 minutes each time (Shivram, *et al.*, 2000). Systolic and diastolic blood pressure reduced following aerobic exercise, according to certain earlier research. (Whelton, 2000; Sohn *et al.*, 2007; Gordon *et al.*, 1997; Ghai, 2007). Our analysis thus supports the conclusions reached by other researchers.

In developed countries, physical activity is widely acknowledged as a highly efficient method of preventing modern chronic diseases, such as hypertension (Haskell, 2000; Blair, *et al.*, 1989). The idea that exercise training might have anti-inflammatory effects that directly contribute to the therapeutic advantages of pulmonary hypertension was the subject of one investigation (U.S. Department of Health and Human Services, 1996). The shift from a wholly inactive lifestyle to some level of consistent physical activity that is sustainable over the long term is a main goal, particularly at the beginning. It is also crucial to recognize that “something is better than nothing” (Cornelissen *et al.*, 2010). Therefore, it is crucial to engage in some form of physical activity rather than sitting down all day.

Results from DHHS (U.S. Department of Health and Human Services (2008) and another study (Kelley, 1999) revealed that when it comes to lowering blood pressure, frequency, time, and method of exercise prescription play a larger influence than intensity. According to the results of one meta-analysis (Sharman *et al.*, 2014), aerobic exercise can help lower SBP and DBP by up to 2% and 1%, respectively. These results are consistent with those of (Sharman *et al.*, 2015), which recommended exercise as the cornerstone therapy for both lowering and treating hypertension. Similar findings to those of the current investigation were observed in another study (Richter *et al.*, 2017). Both studies suggest that the main factor in lowering the prevalence of hypertension is the regular practice of moderate aerobic activity for at least 30 minutes each day.

Because it lowers blood pressure in adults with hypertension by 5-7 mmHg, aerobic exercise is always advised as the first step in lifestyle therapy (Leggio, *et al.*, 2018). Combining dynamic resistance exercise on two to three days per week with 30 minutes or more of moderate-intensity aerobic activity at least five days a week, preferably every day, for a total of 150 minutes or more of exercise per week (Pescatello, *et al.*, 2015). Walking, jogging, cycling, or a combination of these were utilized as the training modalities in the aerobic exercise trials that were included in the aforementioned analyses. Cross-country skiing and swimming are two additional aerobic exercise options that are frequently mentioned in guidelines for exercise training in the therapy of hypertension (Pescatello, 2005; World Hypertension League, 1991; WHO/ISH,

1992; Guidelines Sub-Committee of the Mild WHO/ISH Hypertension Liaison Committee, 1993).

The DASH diet's tendency to lower blood pressure was enhanced by the combination of exercise and weight-loss lifestyle interventions (Blumenthal, *et al.*, 2010), which resulted in a substantial decrease in SBP/DBP of -16.1/-9.9 mmHg. These findings were better than those from the DASH diet-only group (SBP/ DBP = -11.2/-7.5 mmHg) and the usual care group (SBP/ DBP = -3.4/-3.8 mmHg). The findings of the current study support the findings of the studies described previously, which found a strong correlation between physical activity and hypertension. Both hypertensives and normotensives in the current study population who engaged in physical activity for 30 minutes a day reported lower blood pressure compared to those who exercised irregularly, regardless of the amount of time or intensity spent exercising.

CONCLUSIONS

In order to primarily prevent and manage the prevalence of hypertension, population strategies focusing on healthy lifestyle practices must be included at a global level. This is because hypertension is an epidemic that is linked to harmful consequences like CVD, CHD, stroke, heart failure, and renal failure. Even though lifestyle changes are frequently postponed, they should be initiated as soon as feasible and maintained to reap the rewards. The current study focuses on the idea that exercise should be a crucial component of your lifestyle if you want to regulate your blood pressure. The study was conducted prospectively on hypertensive patients who visited the Jain Clinic in Sector 21 of Chandigarh and its surrounding areas. In this study, men and women between the ages of 40-70 years were divided into two groups: those with hypertensives (300) and those with normotensives (101). Both the groups in the current study population who were engaged in physical activity for 30 minutes a day reported lower blood pressure compared to those who were exercising irregularly, regardless of the amount of time or intensity spent exercising. The use of a mix of therapeutic lifestyle treatments has been found to produce the best effects, according to the findings of the current study and the literature that is currently accessible. Engaging in regular aerobic exercise for about 30 minutes a day is one of the lifestyle treatments for the prevention and treatment of hypertension, especially in the North Indian population.

Even though lifestyle changes are frequently postponed, they should be initiated as soon as feasible and maintained to reap the rewards. The successful management of hypertension depends on constant communication between public health policymakers, doctors, and other healthcare professionals as well as patient education about the dangers of high blood pressure, the advantages of lifestyle changes, the need for long-term monitoring, and adherence to treatment. In the future, we advise conducting more integrated therapy techniques, research, and reviews for the treatment of hypertension.

DISCLOSURES

Human subjects: Consent was obtained by all participants in this study. Panjab University Institutional Ethics Committee (PUIEC), Chandigarh issued via letter no. PUIEC/2018/95/95-A/09/01, Dated: 09/04/2018.

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work.

Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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