

Review

Beneficial Effects of Exercise in Hypertensive Patients

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Abstract

Hypertension is the leading cause of cardiovascular disease morbidity and mortality. Additionally, hypertension is associated with fatal complications and premature mortality. The primary prevention of hypertension has emerged as an essential global public health endeavour as the prevalence of hypertension continues to rise. It is frequently advised to engage in physical activity as a significant lifestyle change that may help prevent hypertension. Recent epidemiologic studies have shown a consistent, temporal, and dose-dependent link between exercise and the emergence of hypertension. Given that the positive benefits of exercise on blood pressure lowering have been thoroughly described in recent years, experimental data from interventional research has further proven a link between physical activity and hypertension. Studies presented in the literature strongly define the beneficial effects of exercise on the management and prevention of hypertension. Although the protective advantages of physical activity in high-risk individuals, the variables that may moderate the relationship between physical activity and hypertension, and the ideal prescription for hypertension prevention remain unanswered despite the overwhelming evidence available supporting a role for physical activity in the prevention of hypertension, necessitating the demand for further research, the purpose of this research is to review the available information about the beneficial effects of exercise on hypertensive patients.

Keywords: *hypertension, effects, exercise, physical activity*

Introduction

Hypertension is the major cause of cardiovascular disease and early mortality globally. It is a significant contributor to disability and the most common risk indicator for death (1, 2). In the present time, globally, 874 million adults have systolic blood pressure below 140 mmHg, while 3.5 billion adults have non-optimal systolic levels defined as >110-115 mmHg. Consequently, every one in four adults is affected by hypertension. Due to population growth, population aging, and a 10% rise in the age-standardized incidence of hypertension, there was a 43% increase in the total number of healthy life years lost globally due to non-optimal blood pressure between 1990 and 2015. According to the Global Burden of Disease study, high blood pressure continues to be the largest risk factor for disease and all-cause mortality worldwide, accounting for 8.5% of all global deaths and 9.4 million healthy life years lost each year (3). Hypertension is defined as a persistent systolic blood pressure of at least 130 mm Hg or a diastolic blood pressure of at least 80 mm Hg (4).

Hypertension is strongly correlated with a sedentary lifestyle. Exercise and/or physical activity have been demonstrated to delay the onset of hypertension. Exercise that lowers blood pressure successfully includes both aerobic and strength training. Post-exercise hypotension is the term used to describe the decrease in blood pressure that occurs after a workout and lasts for up to 24 hours. With consistent activity, a 5-mmHg overall blood pressure drop may be guaranteed. Systolic blood pressure drops by 5 mmHg, which results in a 9% decrease in coronary heart disease mortality, a 14% drop in stroke mortality, and a 7% decrease in all-cause mortality. Therefore, regular exercise should be encouraged for everyone, including those with normotension, prehypertension, and hypertension (5). Exercise lowers blood pressure directly and reduces inflammation via the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis, resulting in acute, post-exercise, and chronic physiologic impacts. Current recommendations for managing mild to moderate hypertension include a strong emphasis on the value of nonpharmacologic

approaches, such as physical activity. It has been demonstrated that aerobic exercise of moderate intensity can assist treat stage 1 hypertension as well as prevent hypertension. If performed appropriately, dynamic resistance workouts can help reduce systolic and diastolic blood pressure (6). The purpose of this research is to review the available information about the beneficial effects of exercise on hypertensive patients. This study is based on a comprehensive literature search conducted on May 5, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point.

Review

Although there has been progress in the treatment of hypertension, its prevalence is still high and is a major contributor to the development of cardiovascular disease. Since the success rates of the available treatments have decreased, resistant hypertension presents a challenge for clinicians. Exercise training and physical activity are crucial for blood pressure management. In the present recommendations and guidelines for the management of arterial hypertension, a number of professional organizations acknowledge the significance of physical activity and exercise training as components of a holistic lifestyle intervention. Blood pressure can be lowered and hypertension can be managed with the use of aerobic exercise, dynamic resistance exercise, and concurrent training, which combines dynamic resistance and aerobic exercise training in the same exercise session or on different days (7). There is a link between oxidative stress and the development of hypertension. The negative effects of the relationship between oxidative stress and hypertension have been identified as endothelial dysfunction and decreased nitric oxide levels. In the majority of earlier investigations, it was discovered that aerobic exercise dramatically reduced oxidative stress and blood pressure in hypertension

participants. However, vigorous aerobic exercise can also harm endothelial cells. Only systolic blood pressure normally drops during isometric exercise (8).

Exercise for prevention and management

Hegde et al. described that for the primary prevention and management of hypertension, exercise is an essential component of lifestyle therapy. Numerous studies have shown that exercise has positive effects on hypertension, lowering both systolic and diastolic blood pressure by as much as 5-7 mmHg in those who already have the condition. Exercise has been linked to sharp reductions in systolic blood pressure that occur right away. This initial drop in blood pressure following exercise, known as post-exercise hypotension, can last for almost 24 hours and has the strongest impact in people with higher baseline blood pressure. The exercise training response, which lowers blood pressure more consistently with more frequent or continuous exercise (9). Sharman et al. defined regular aerobic exercise, or having a high degree of fitness, as having been demonstrated in numerous studies to be preventive against the emergence of hypertension in men in the future. For women, there are, however, fewer studies and less prognostic data available. On the other hand, there is strong evidence that dynamic aerobic training, even at a relatively modest intensity, lowers 24-hour ambulatory blood pressure, light exercise blood pressure, and resting blood pressure in both normotensive and hypertensive people, regardless of sex. Exercise training leads to significant decreases in blood pressure in persons with high baseline readings. Importantly, blood pressure reductions are dose-dependently correlated with even relatively small increases in physical activity above sedentary levels (10).

The effects of exercise on lowering blood pressure have been the subject of numerous randomized controlled trials. Numerous meta-analyses of these clinical trials have been published in an effort to measure the antihypertensive effects of exercise more precisely. These meta-analyses demonstrated that among adults with hypertension, dynamic

resistance training lowers blood pressure by 2-3 mmHg, while aerobic exercise training lowers blood pressure by 5-7 mmHg. These blood pressure drops rival those attained with first-line antihypertensive medications in terms of magnitude and reduce cardiovascular disease risk by 20–30%. Exercise can reduce all-cause mortality among hypertensive patients by as much as one day per week, and it may even be more effective than medication in doing so (11).

Knowles et al. described that in children; high blood pressure is more prevalent than ever. Regular exercise lowers blood pressure in adults, but there are limited research studies in children, and the findings reported are variable. The authors further described the findings of their longitudinal study, which revealed that both at baseline and during follow-up, baseline total physical activity was inversely related to diastolic blood pressure; hence, this study supports the case for a causal relationship between increased physical activity and decreased blood pressure in children who are as young as 5 years of age, regardless of their weight status (12). Results of another longitudinal study among young adults depicted that participating in physical activity that was more intense than light during the previous year was linked to a lower risk of having blood pressure that is in the hypertensive range when adjusted for age, sex, mother's education, usage of alcohol, and cigarette consumption (13). Findings from a follow-up cohort study showed that prehypertension and hypertension prevalence increased by a third in children receiving standard physical education, from 16.74% to 21.97%, but decreased by one-sixth in those receiving high physical education from 16.85% to 13.87%. The prevalence of hypertension itself increased by a third in children receiving standard physical education, from 9.82% to 13.12%, but decreased by one-fifth in those receiving elevated physical education, from 9.60% to 7.75%. The authors further recommended that children's arterial blood pressure is improved by increasing exercise/physical activity levels at school by increasing the frequency of physical education courses. A sufficient number of physical education

courses can be incorporated into the school schedule to help early hypertension prevention in children (14).

Results of a study by Weres et al. demonstrated that when the number of steps was normal, there was a noticeably lower incidence of hypertension in the entire study group. The study supported the preventive benefits of exercise against hypertension in older children and adolescents. It should be noted, though, that no such association has been shown to exist in the case of pre-schoolers (15). However, findings from a randomized control trial demonstrated that children with excessive sedentary time may no longer benefit from physical activity's blood pressure-lowering effects, which emphasizes the need to lower overall levels of sedentary time in children's daily lives, both in and out of school (16). Exercise is beneficial for blood pressure control among elderly patients, as defined by the results of a study by Kazeminia et al. which reported that physical activity significantly lowers both systolic and diastolic blood pressure. Therefore, frequent exercise can be incorporated into a hypertensive elderly patient's therapy regimen (17). You et al. demonstrated in their study findings among middle-aged and elderly adults that the likelihood of hypertension was lower in those who regularly engaged in moderate-to-vigorous activity for longer than 10 minutes ($P = 0.0006$), and in order to have a positive impact on hypertension prevention, intense exercise may be more significant than moderate or mild exercise (18). Similarly, Baptista et al. suggested that older hypertensive individuals who are taking medication will only see an improvement in their physical functioning and quality of life if they start an exercise program, which will also help them better manage their blood pressure and other cardiovascular risk factors (19).

Likewise, results of a randomized controlled trial showed that for the regulation of blood pressure in female older individuals with stage 1 hypertension, the stepping exercise studied is an effective non-pharmacological intervention. Physical performance and quality of life both improved as a result of this exercise (20). Furthermore, Lin and Lee described in their study that exercise training

has positive effects on blood pressure, autonomic tone, baroreflex sensitiveness, oxidative stress, nitric oxide, bioavailability, lipid profiles, cardiovascular function, and cardiorespiratory fitness in hypertensive postmenopausal women (21). Findings of a meta-analysis showed exercise training generated small but clinically relevant reductions in systolic and diastolic blood pressure and mean arterial pressure in menopausal and postmenopausal women, younger or older than 65 years, with prehypertension or hypertension. However, combined training resulted in more significant decreases (22). Results of meta-analysis showed that nitric oxide levels increased by 30.4%, while systolic blood pressure decreased by 16.2%. Body mass index dropped by 6%, while diastolic blood pressure decreased by 9.5%. Nitric oxide levels improved, and hypertension was controlled in obese postmenopausal women who exercised for two months at a moderate intensity (23). According to the existing experimental data, physical activity is good for redox status and hypertension. The choice of the proper exercise's intensity, duration, frequency, and type is crucial from a clinical standpoint. This is not only due to the fact that incorrect exercise will be unsuccessful, but also because it may be pathogenic and result in heart injury and endothelial dysfunction. Therefore, extreme sports athletes or older patients who are more susceptible to mechanical injury should pay extra attention (8).

Present recommendations

Rego et al. suggested that children and teenagers should exercise every day for 60 minutes or longer at a moderate to strenuous level. Adults should engage in 150 to 300 minutes per week of moderate-intensity aerobic activity, 75 to 150 minutes per week of vigorous-intensity aerobic activity, or an equivalent combination of both. They should also engage in muscle-building exercises at least twice a week. Multicomponent activities, such as dancing and sports, should be added for older people because they entail more than one type of exercise, like aerobics, muscle-strengthening, and balance. Recommended guidelines for exercise among hypertensive patients as per various professional

associations and organizations are illustrated in (Table 1) in detail (24). Alposy recommended resistance exercise on two to three days a week, or moderate-intensity aerobic exercise for at least 30 minutes on three days a week. Exercise sessions can be either continuous for 30 minutes or made up of at least 10 minutes of brief exercise per day (5). The present literature strongly advocates the beneficial

effects of exercise on hypertension; however, studies available addressing the effects among children and the elderly population in recent times are quite limited, necessitating the need for further research, including trials targeting various age groups, to elaborately study the beneficial effects of exercise and generate more evidence-based guidelines in addition to adding to the literature.

Table 1: Recommended guidelines for exercise in hypertensive patients as per professional organizations and associations (24)

FITT principle	Brazilian Society of Cardiology	Canadian Hypertension Education Program	European Society of Cardiology/European Society of Hypertension	American College of Cardiology and American Heart Association	National Heart Foundation of Australia
Frequency	3-5 days a week	4-7 days/week	5-7 days/week	–	–
Intensity	Moderate intensity (50%-70% HR reserve)	Moderate intensity	Moderate intensity	65%-75% of HR reserve	Moderate/vigorous intensity
Time	30-50 minutes session	30-60 minutes per session	30 minutes/session	90-150 minutes/week	150-300 minutes (moderate intensity) or 75-150 minutes (vigorous intensity)
Type	Aerobic exercise	Aerobic exercise	Aerobic exercise	Aerobic exercise	Aerobic exercise
Primary evidence rating	Class II a- Grade Ba	Grade Db	Class I-Grade Ac	Class I- Grade Ad	–
Complementary training	Resistance training (2-3 days/week;8-10 exercise for major muscle groups:10-15 repetitions for each exercise: passive resting between 90 and 120 seconds)	Resistance training only for patients at stage 1	Resistance training (2-3 times/week)	Resistance training (90-150 minutes/week:50 %-80% of HR reserve; 6 exercises;3 sets/exercise;10 repetitions/exercise)	Muscle stretching exercise at least 2 days/week
Evidence rating	Class II a-Garde Ba	Grade Db	–	–	–

Conclusion

Exercise has a well-established blood pressure-lowering effect and is hence highly recommended for both the prevention and treatment of hypertension. However, patient adherence to physical activity or exercise is a challenge that can be successfully addressed with health promotion and education activities by healthcare staff highlighting the beneficial effects of exercise and its incorporation into daily activities to achieve optimal outcomes in addition to effective pharmacological therapy.

Disclosure

Conflict of interest

There is no conflict of interest

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Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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