

The Effect of Aerobic Exercise and the DASH Diet on a Sample of Chronic Hypertensive Patients

Hassan Adnan Hussein*

Department of First Grade Teacher, Collage of Basic Education, University of Sumer, 64005, Iraq

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*Correspondence: Hassan Adnan Hussein

Email: hassan.adnan@uos.edu.iq

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Abstract: This study examines the effects of aerobic exercise and the DASH diet on chronic hypertensive patients aged 40–50 years. High blood pressure is a widespread chronic condition influenced by genetic, lifestyle, and environmental factors. This research aims to prepare tailored aerobic exercises and implement the DASH diet to evaluate their combined impact on blood pressure management. Using a single-group experimental design, the study involved ten non-athletic male participants with chronic hypertension, selected randomly from Thi Qar Governorate, Iraq. Participants engaged in a 12-week intervention consisting of aerobic exercise and adherence to the DASH diet. Data were collected through pre- and post-tests measuring systolic and diastolic blood pressure. Results revealed significant improvements, with systolic pressure decreasing by 8.7% and diastolic pressure by 8.16%. The study highlights the synergistic effects of physical activity and a healthy diet in reducing blood pressure, underscoring their importance in managing hypertension and improving overall health.

Keywords: Aerobic Exercise, DASH Diet, Hypertension, Chronic Disease,

Physical Activity

Introduction

Sport is very essential to the life of every human being, as it maintains his health, fitness, stature and physical strength. It is of great importance at every stage of life, as it improves the human personality and improves his mood, and sport keeps all our internal organs alert, healthy and functional and strengthens our hearts by practicing some types of sports regularly. Because of its versatility and the variety of equipment available, by practicing sports even at a young age, a person can also be better and free from certain diseases. By practicing sports.

One of the effects of practicing sports on the individual is that the individual enjoys high physical health, enabling him to practice all his life activities well, away from the issues resulting from lack of movement. In addition, regular exercise helps the individual to resist many deadly diseases, and thus enjoy a beautiful life, especially in light of the disappearance of the specter of obesity that haunts a large percentage of the world's population; as a result of wrong human behaviors, especially lack of exercise and eating unhealthy food. Overcoming bad habits that drain human energy by spending leisure time practicing useful activities that bring great and enormous benefits. Building strong social

relationships and forming new friendships that bring a beautiful meaning to one's life; through the contribution of various sports, especially team sports, in bringing people closer together and reducing the distances between them. Improving human behavior, refining his personality, and giving him high self-confidence and the ability to face different life situations.

The benefits of exercise for the body are very many, some of which we may know and others may seem strange, but they are real: It keeps the heart in a constant state of activity and whenever a person exercises, the heartbeat increases and thus increases the pumping of blood loaded with oxygen and food to all parts of the body, and this is important for heart patients to protect them from coronary artery clots. Sport strengthens bones and protects people from osteoporosis, strengthens muscles and delays aging, for example, we see on television elderly people who enjoy full health and do not suffer from any diseases despite their age exceeding eighty years, and this is evident in East Asian countries such as China and Japan because sports in their schools are taught from a young age like any other important subject, especially Taekwondo. In addition, sports and obesity do not mix, as sports keep the body slim because they burn fat, tighten the body, and maintain the appropriate weight for the person who practices them, which gives him self-confidence that we often notice on athletic people. Oddly enough, sport is an important factor for those who suffer from insomnia, as the effort exerted during exercise helps the body to sleep comfortably. Sport has an impact on relieving stress, anxiety and fatigue, and also helps relieve depression, so psychologists recommend practicing sports because it gives a sense of energy and activity, which relieves psychological fatigue, and one of its benefits is that it helps to concentrate.

Regular exercise protects the individual from many temporary and chronic diseases, including blood pressure, as high blood pressure is one of the common cardiovascular diseases in societies.

The incidence of this disease ranges from (10-40) % and the percentage varies according to different societies and countries, and about (90) % of cases of hypertension are idiopathic and here they are called primary or primary hypertension (only 10) % of cases of hypertension are recognized the causes that led to them and are called secondary hypertension (Hassan, 1994).

It is worth noting that the pressure is influenced by a group of factors, namely the type of physical training, the number of muscles involved in the physical work and the position of the body during the performance because the dependence on the balance between the magnitude of the increase in blood flow due to the increase in cardiac output and the decrease in peripheral (vascular) resistance caused by the expansion of small blood circulation (Sancier, 1996).

High blood pressure is one of the most widespread chronic diseases, especially in Eastern societies, which do not give sports and a healthy diet any importance in daily life, and here lies the importance of research.

Research issue:

High blood pressure is one of the most common chronic diseases around the world, affecting millions of people. Lifestyle factors, including exercise and a healthy diet, play a crucial role in managing blood pressure. However, many studies indicate that many blood pressure patients do not exercise regularly and do not follow balanced diets, which may worsen their health condition. The research issue is to highlight the relationship between lack of physical activity and lack of a healthy diet in blood pressure patients.

Research Objectives:

1. Preparing aerobic exercises and following the DASH diet for a sample of blood pressure patients.
2. To determine the effect of aerobic exercise and a healthy diet prepared by the researcher on a sample of blood pressure patients.

Areas of research:

1. Human subjects: sample of male blood pressure patients aged (40-50) who are sedentary.
2. Spatial domain: gymnasium for fitness and body building in Thi Qar governorate.
3. Temporal domain: From 3/15/2023 to 8/15/2023.

Methodology

Many cases and phenomena can only be studied through a method that suits the issue, so the experimental method was used in the method of tight control in solving this issue, "which is an attempt to control all the basic factors affecting the dependent variable or variables in the experiment except one factor that the researcher controls and changes it in a specific way with the intention of identifying and measuring its effect on the dependent variable or variables" (Nouri Al-Shawk and Rafi Al-Kubaisi, 2004) So the researcher adopted the single-group experimental method because it suits the nature of the issue and achieving the objectives of the research, and the researcher adopted the following experimental design:

Table (1) shows the experimental design of the experiment

Post-tests	Independent variable	Pre-tests	Variables	Groups
Post-tests	Aerobic exercise	Aerobic capacity test	Systolic Blood Pressure+ Diastolic blood pressure	Experimental group
	The DASH Diet			

The research population and sample:

The sample was selected by the random method, consisting of (10) men for the main experiment and (2) men for the exploratory experiment, and they were selected from sedentary men (non-athletes) of chronic blood pressure patients, and the sample was accurately selected in terms of age, where their ages ranged between (40-50) years and in terms of mass, where the choice fell on men whose mass ranged between (85-95) kg, and was as follows:

Table (2) shows the distribution of the research sample

Main experiment sample	Exploratory trial sample	Total number
10	2	12

To ensure that the sample is homogeneous and falls within the normal distribution, the skewness coefficient was extracted for some variables (age, mass, and height), as it is clear that all skewness coefficient values were between (± 3), which indicates that the study sample is homogeneous. As shown in Table (3).

Table (3) shows the normal distribution of the sample

Torsion coefficient	Standard deviation	Standard error	Arithmetic mean	Unit of measurement	Variables
0.179	7.196	1.754	46.35	Year	Age
2.199	10.592	2.104	87.56	kg	Weight
0.236	7.440	1.754	173.56	cm	Length

Methods, devices and tools used in the research:

- a. Data collection methods:
 - i. Observation
 - ii. Tests and measurements
 - iii. Arabic and foreign sources
 - iv. Internet
 - v. Interviews
 - vi. Questionnaire
- b. Equipment and tools used:
 - i. Treadmill of American origin
 - ii. Labtecl device of American origin
 - iii. Mercury sphygmomanometer
 - iv. Stethoscope
 - v. Medical scale for measuring mass
 - vi. Tape measure for measuring height
 - vii. Rubber bands of different resistances
 - viii. Weights (dumbbells) with a weight of (1-5) kilograms
 - ix. Medical mat
 - x. Stopwatch
 - xi. Electronic computer
 - xii. Digital Calculator

Main research procedures:

- a. Preparation of aerobic exercise

The researcher prepared appropriate aerobic exercises for the study sample by relying on scientific sources in the field of sports training and consulting some experts in the field of training, physiology and sports medicine, as well as taking the advice of some specialized doctors and focusing on a set of points in developing

exercises and making them not negatively affect or cause injuries or side effects to the sample members:

These exercises included:

1. Warming up for (5) minutes at the beginning of the experiment with an increase (one minute) every week until reaching (10) minutes.
2. Jogging + light running at a speed of (4) km/h on an electric treadmill.
3. Stationary bike workout
4. Swedish exercises
5. Light exercises using rubber ropes and light weights.
6. Cool down, relaxation and stretching exercises at the end of each training unit.

A few points were taken into account in the development and implementation of these exercises:

1. Medical evaluation and physical examination through medical consultation, where the latest examinations of the sample members were presented to a specialized doctor to know the extent to which the sample members can perform the exercises without side effects and other injuries.
2. Gradually increasing the intensity and volume of the exercises in accordance with the sample's ability.
3. Diversify the exercises in a thoughtful manner because diversifying the exercises helps to avoid boredom and injury, and ensures the work of all the muscles of the body.
4. Focus on safe exercises: Avoiding difficult exercises that cause fatigue and fatigue and are not suitable for the sample members.
5. Perform the exercises correctly to avoid injuries.
6. A qualified athletic trainer was used to ensure correct performance and monitor performance.
7. Replace the exercise with another exercise if the tester is unable to perform it.
8. Ensure adequate rest time between exercises and between units to compensate the body for the effort exerted.
9. Encourage testers to drink enough water before, during, and after exercise.
10. Emphasize cool down and stretching exercises after each training unit.

The experiment period was (12) weeks with (3) training units per week, i.e. a total of (36) training units, and the time of one training unit was from (45-60) minutes, and the intensity was calculated by the following formula:

$$220 - \text{Age} = ? = \frac{? \times \% 75 \text{ heart rate}}{100}$$

By applying the previous equation to the ages of the testers to extract the appropriate intensity for them, where the appropriate intensity by heartbeat reached (130-133 beats per minute) This intensity ensures that the testers remain under the oxygen system and at an intensity of (55%-70%) of the maximum intensity for each individual of the testers to be graduated according to the acclimatization and adaptation of the testers.

The DASH diet (Sara Boyer: 2015, p.66)

The DASH diet is a dietary plan based on studies sponsored by the National Heart, Lung, and Blood Institute in the United States, according to the U.S. National Library of Health. The name "DASH" is an acronym for Dietary Approaches to Stop Hypertension. The DASH diet helps lower high blood pressure, high cholesterol and high blood fats, lowers the risk of heart attack and stroke, and helps with weight loss.

DASH is a recommended diet for people who want to avoid or treat high blood pressure and reduce the risk of heart disease. The diet was created after researchers noticed that high blood pressure was less common in people who followed a plant-based diet. This diet helps in achieving a heart-healthy dietary lifestyle and does not require special foods or beverages. The DASH diet not only lowers your blood pressure, it can also increase your levels of "good cholesterol," lower your triglyceride levels, and help you lose a significant amount of weight:

1. Eat foods that are low in saturated fat, cholesterol, and contain fruits, vegetables, and low-fat dairy products.
2. Eat whole grains, poultry, fish, and nuts, and limit red meat, sweets, and sweetened beverages. Include foods high in potassium, calcium, magnesium, protein, and fiber.
3. Eat foods that are low in salt (sodium); they lower blood pressure.
4. The instructions and guidelines of the DASH diet were printed by the researcher in the form of a small booklet with illustrative pictures and were explained, illustrated and distributed to the sample smoothly in a way that suits the dietary culture of the testers and urged them to adhere to it throughout the research experiment.

Exploratory experiment:

The researcher conducted an exploratory experiment on a sample consisting of two people outside the main sample of the study, as exploratory experiments, or what is called exploratory studies, are one of the most important research procedures that the researcher undertakes in order not to fall into errors, difficulties or issues during the main experiment. The exploratory experiment is a miniature experiment of the main experiment for the purpose of either revealing some scientific facts or experimenting with work to reveal the obstacles and negatives facing the application of the main experiment or for the purpose of training some cadres of assistants to work" (Haider, 2015).

The purpose of the exploratory experiment was to:

1. Legalization of exercises: Determine exercise parameters in terms of intensity, volume, and rest periods.
2. Evaluate the ability of the sample: Measuring the extent to which participants are able to perform the exercises.

3. Determine the time required: Find out how much time is needed to execute the exercises effectively.
4. Train the staff: Educating trainers or teachers on how to apply the exercises correctly.
5. Identify the equipment and devices needed to perform the exercises, as well as the required modules and programs.
6. Identifying challenges: Studying the issues and difficulties that the researcher may face before starting the main experiment.

Anthropometric measurements:

- a. Measurement of total body length (Muhammad, 1997).
Objective of the test: Knowing the length of the body.
Tools used: A numbered ruler mounted on the wall.
Performance specification: The total length is measured by standing barefoot in an upright position with the tester's back to the ruler and touching it at three points (heel of the feet - back of the hip - flaps) and the measurement is calculated from the top point of the skull by reading the scale in (cm)
Recording: The length of the descending column from the top of the head to the bottom of the feet is recorded on the floor.
- b. Measurement of body mass (Muhammad, 1997);
Objective of the test: Knowing the body weight.
Tools used: Medical scale.
Performance specifications: The tester stands over the drum of the scale at the exact center and the body weight is distributed over the feet and then the weight is taken.
Recording: The weight is read and recorded to the nearest 100 grams (0.1 kg).

Pre-testing:

The researcher performed the pre-tests on the research sample of those suffering from chronic blood pressure disease with the help of an assistant team and a medical assistant.

- a. Measurement of blood pressure:
The researcher used the indirect method to measure this indicator (Aboulela: 1997).
Purpose of the test: Measuring systolic and diastolic pressure.
Tools used: Stethoscopes / mercury sphygmomanometers.

Measurement method:

1. Prepare the person before the measurement and must be in a calm state for at least half a minute, and when measuring, the patient sits on a chair and puts the elbow on a table in a comfortable position with the palm slightly extended, noting that the palm is upwards.
2. Wrap the rubber bag of the device around the humerus and at the level of the heart, noting that it is above the elbow and placing the inflatable part inside the arm.
3. Determine the point of passage of the brachial artery above the elbow joint, usually in the lower medial part of the humerus, then place the stethoscope on the artery and then close the valve of the device.

4. Start inflating the band, which raises the air pressure inside the rubber bag until it reaches the level of (180) millimeters. At rest, and during training, it reaches (200) or (220) millimeters. g.
5. Exhale the air and reduce the pressure slowly at a rate of (2-3) mm. G per second while listening carefully to the first sound of the heart with a stethoscope, which indicates the passage of blood through the artery, and this is called systolic pressure.
6. Continue listening to the heart sound as the air pressure continues to decrease until the sound becomes "Muffled", and thus the sound disappears completely, and once it disappears, the reading is recorded, which is called diastolic pressure.
7. The researcher then applied his exercises and diet to the research sample as mentioned above.

Statistical methods:

- Mean
- Standard Deviation
- Correlated samples t-test
- Equations of change

Presenting, analyzing and discussing the results:

a. Presentation and analysis of results:

Presenting and analyzing the results of the tests (pre- and post-tests) at rest time for the research variable:

Table (4) shows the arithmetic means, standard deviations, and the equation of change for the pre- and post-tests before effort

Change formula	Calculated t-value	Dimensional testing		Tribal test		Unit of measurement	Search parameter
		Standard deviation	mean	Standard deviation	mean		
8.7	11.385	4.816	129.87	4.045	141.378	mmHg	Systolic pressure
8.16	7.689	2.799	85.67	3.738	93.312	mmHg	Diastolic pressure

Tabular t-value at the 0.05 significance level = 1.96

Table (4) shows the results of the research and the (t) test to know the differences between the arithmetic means of the tests (pre- and post-tests) of the research variables at rest time. The calculated (t) value for systolic pressure reached (11.385), which is greater than the tabular (t) value of (1.96) with a degree of freedom (9) and a significance level (0.05), which proved the significance of the differences and in favor of the post-test. The calculated (t) values for the diastolic pressure variable were (7.689), which is greater than the tabular (t) value mentioned above, which indicates that it is a significant difference, as well as the value of the change in systolic pressure (8.7) and diastolic pressure (8.16), which confirms the significance of the difference.

Result and Discussion

With reference to the results of the pretest and posttest for the research sample, we notice that there are statistically significant differences in favor of the posttest and the researcher attributes this change to the effect of practicing physical activity and following the DASH diet on chronic blood pressure patients, which led to a significant improvement in the state of health of the sample members, and this can be summarized according to the physiological and biological mechanisms behind this effect in two main:

First: Regular physical activity leads to lower blood pressure as exercise improves cardiovascular function, which leads to increasing the heart's efficiency in pumping blood and dilating blood vessels. This in turn reduces the resistance that blood faces while flowing through the arteries, which contributes to lowering blood pressure. On the other hand, improving insulin sensitivity as exercise helps increase the sensitivity of cells to insulin, which contributes to regulating blood sugar levels and reducing insulin resistance, a condition associated with high blood pressure. Physical activity also contributes to reducing levels of cortisol, the stress hormone associated with high blood pressure, in addition to reducing cortisol levels.

Secondly: The DASH diet has many effects on the body, as it relies on reducing sodium intake, which contributes to lowering blood volume and reducing pressure on the artery walls. It also focuses on increasing potassium intake, as potassium increases the excretion of sodium from the body, which helps lower blood pressure, and a diet rich in fruits and vegetables helps maintain the acid-base balance in the body, which contributes to lowering blood pressure. The DASH diet also provides the body with essential nutrients such as vitamins, minerals, and fiber, which play a vital role in cardiovascular health.

The researcher attributes this improvement in the subjects' condition to the synergistic effect between the researcher-prepared exercises and the DASH diet, i.e. when physical activity and the DASH diet are combined, the effect on lowering blood pressure is much greater than if they were applied separately. This is because both agents work at different levels to improve cardiovascular function and regulate blood pressure. The bottom line is that physical activity and a healthy diet are key pillars in the management of chronic hypertension. Through complex physiological and biological mechanisms, they contribute to lowering blood pressure and improving overall health. Therefore, it is highly recommended that chronic hypertension patients incorporate these two factors into their daily lifestyle.

Conclusion

1. The exercises suggested by the researcher (under investigation) have a positive effect on lowering the level of hypertension
2. The combination of the proposed exercises and the DASH diet has a significant positive effect on the blood pressure of the research sample.
3. The continuous progression of the training load in the weekly sessions led to positive results in the sample.

4. Positive side effects appeared on the sample, such as a slight decrease in body weight.

Recommendations

1. The necessity of practicing the exercises under research or any other aerobic exercise in order to maintain normal blood pressure, especially on people of the same age as the research sample.
2. Adherence to the DASH diet by patients with chronic blood pressure or any other system, as proper nutrition has a major role in controlling blood pressure.
3. Conducting other studies with the same independent variables on a sample of women or different ages while controlling the components of the training load (intensity, volume and rest) and also increasing the number of training units per week.

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