Effect of Aerobic Exercise on The Psychological Stress State of Hypertensive Patients

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Abstract

Hypertension may also be referred to as essential hypertension. The circulatory movement is in its early stages. Hypertension is a self-contained systemic ailment characterised by elevated arterial blood pressure, leading to detrimental effects on various organs such as the heart, brain, kidneys, and other bodily systems. The term "high" refers to a state or condition that is elevated or above average. Hypertension is a prevalent and highly morbid condition within the cardiovascular system. The prevalence of hypertension in our nation is experiencing an upward trend, with a concomitant rise in the proportion of hypertensive adults observed annually. Currently, the predominant approach to managing hypertension in our nation revolves around pharmacological interventions; however, it is worth noting that these drug treatments are associated with certain adverse effects. In the long term, there is a significant fluctuation in blood pressure following discontinuation. There is an urgent need for an improvement to be made regarding this particular phenomenon. The objective of this study is to examine the impact of aerobic exercise on stress levels, quality of life, and lipid and glucose metabolism among hypertensive adults. A total of 92 individuals diagnosed with hypertension were assigned to two groups: a control group consisting of 46 participants, and a study group also consisting of 46 participants. The allocation of individuals to each group was determined based on digital criteria. Both cohorts were administered a regimen of pharmaceutical compounds, with the experimental group additionally engaging in aerobic exercise as an adjunctive intervention. The researcher employed the Self-Assessment Scale (SAS) to assess levels of anxiety, and the Health Questionnaire (MOSSF36) to evaluate the quality of life in both experimental groups prior to and following a 10-week intervention period. In the present study, we compared the levels of total fat (TC), triacylglycerol (TG), high-density lipoprotein (HDL-C), low-density lipoprotein (LDL-C), fasting blood glucose (FPG), and insulin (FINS) in addition to insulin sensitivity index (ISI), systolic blood pressure (SBP), and diastolic blood pressure (DBP) between the two groups. Following the intervention, the study group exhibited a statistically significant decrease in SAS scores compared to both the pretreatment and control groups ($P<0.05$). Additionally, both the pretreatment and control groups demonstrated elevated levels of cardiac (RE) and mental health (MH) roles. The study group exhibited higher scores in physical health (PH), general health (GH), vitality (VT), role emotional (RE), and mental health (MH) compared to the control group after treatment ($p < 0.05$). However, there was no significant difference observed between the two groups in terms of physical pain (BP) and social functioning (SF) ($p > 0.05$). There were no statistically significant differences observed between the before and after treatment groups ($P>0.05$) in terms of LDL-C, FINS, FPG, SBP, and MP. The results of the study indicate that the observed values of HDL-C and ISI in the study group were significantly higher than those in the control group after treatment ($P<0.05$). Additionally, it was found that the values of HDL-C and ISI in the study group were also higher after treatment compared to their own values before treatment ($P<0.05$). Hypertensive diseases can be attributed to elevated hormone levels, increased blood lipid concentrations, and reduced nitric oxide levels within the body. The phenomenon is attributed to underlying factors of a lesser magnitude. Aerobic exercise interventions of extended duration have been shown to have a positive impact on both systolic and diastolic blood pressure levels in individuals diagnosed with hypertension. The reduction in blood lipids and plasma endothelin levels leads to improved blood glucose regulation and enhanced nitric oxide-mediated vasodilation, thereby contributing to the maintenance of stable blood pressure levels within the body. Aerobic exercise has been found to have a beneficial impact on stress levels, quality of life, and blood lipid profiles. The voluntary enhancement of blood glucose and blood pressure has been observed in elderly individuals with hypertension.

Keywords: Diversified health education; Aerobic exercise; hypertension; Healthy behaviour; Psychological pressure

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Introduction

The objective of this study is to examine the impact of aerobic exercise on stress levels, quality of life, as well as lipid and glucose metabolism in hypertensive adults. The etiology of hypertension involves the pathophysiological processes of arteriosclerosis and dysregulation of the vascular motor centre. Hypertension is a pathological condition characterised by a chronic elevation in arterial blood pressure. This condition is commonly referred to as essential hypertension. Hypertension is a prevalent cardiovascular condition, with its primary manifestation being vertigo. Symptoms experienced include headache, swelling, palpitation, and insomnia. Cognitive impairment results in the inability to recall or retain information. Hypertension is a prevalent and highly morbid condition within the cardiovascular system. In the context of our nation, The prevalence of hypertension is experiencing an upward trend, with a concurrent rise in the proportion of hypertensive adults observed annually. Currently, the predominant approach to managing hypertension in our nation revolves around pharmacological interventions. However, it is important to acknowledge that drug treatments for hypertension are accompanied by adverse effects. The blood pressure exhibits significant fluctuations upon discontinuation of the extended duration course. There exists a pressing need to devise a methodology for enhancing this phenomenon. The prevalence of hypertension is on the rise as a result of economic growth, alterations in the living environment, and the extension of individuals' lifespans. Based on data provided by the World Health Organisation, the occurrence of hypertension in Europe and the United States exceeds 20%, while in the United States specifically, it ranges between 10% and 20%. In African nations, the prevalence of hypertension stands at 10%. Hypertension is the prevailing cardiovascular ailment in China and represents a significant risk element for both stroke and heart disease. In recent times, there has been a noticeable trend towards a lower age of onset for this particular ailment, with approximately 34 percent of individuals affected falling within the young or middle-aged demographic. Middle-aged and young hypertension, also known as primary hypertension, is characterised by a systolic blood pressure not exceeding 140 mmHg and a diastolic blood pressure of 90 mmHg or higher. The predominant form of this condition is simple diastolic hypertension. The prevalence of hypertension is steadily rising on an annual basis. According to the findings of the National Nutrition and Health Survey conducted in 2012, approximately 22.2% of individuals within the age range of 30 to 60 years exhibited symptoms of hypertension. Furthermore, the survey results obtained by the Research Centre for Cardiovascular Disease Prevention and Control, an entity under the Ministry of Health, in 2017 indicated that approximately 30% of the employed population residing in Beijing were diagnosed with hypertension. Individuals in the middle-aged and young demographic who suffer from hypertension exhibit several distinct characteristics. These individuals are predominantly involved in high-stress occupations, engage in social activities that induce mental strain, experience elevated levels of psychological pressure, maintain irregular lifestyles, lack sufficient rest, consume excessive amounts of alcohol, adhere to unregulated dietary patterns, and are exposed to various other factors that collectively contribute to the activation of the sympathetic nervous system. Consequently, these factors result in an elevation of plasma catecholamine levels, intensification of resistance arteriole contractions, and an overall increase in blood pressure; the arterial elasticity in young and middle-aged individuals is favourable, leading to a reduction in arterial wall pressure. The systolic pressure is within the normal range or slightly elevated, typically ranging from 140 to 150 mmHg. In contrast, there is a notable increase in diastolic pressure, which can reach levels of 100 to 110 mmHg. This condition is predominantly observed in male individuals, potentially linked to certain unfavourable lifestyle choices among men. Additionally, some patients exhibit a strong correlation between their hypertension and a family history of the condition. Low-risk and medium-risk hypertension in Grade I and II are frequently observed, characterised by relatively mild symptoms, a lower incidence of metabolic disorders, and a reduced likelihood of target organ damage. Approximately 50% of patients exhibit no symptoms during the initial stages, while certain individuals may experience symptoms such as dizziness, visual impairment, or fainting. The primary factors contributing to this issue are insufficient self-management practises and suboptimal adherence to prescribed medication regimens. Adverse factors for hypertension control among young and middle-aged rural men with hypertension include body mass index, taste preferences, family history of hypertension, smoking and drinking habits, and labour intensity. Conversely, physical exercise serves as a protective factor for hypertension control in this population. According to available reports, the primary risk factors associated with hypertension in individuals who are young or middle-aged encompass a familial predisposition to hypertension, obesity, gender, alcohol dependency, tobacco use, elevated lipid levels, high blood sugar levels, occupational stress, and sleep disturbances.

The majority of patients exhibit varying degrees of risk factors for hypertension. Approximately 50.49% of the patient population exhibits the presence of more than two risk factors concurrently, while approximately 25.73% of patients demonstrate the co-occurrence of more than three risk factors simultaneously. Among the male patients, a significant proportion of 58.87% exhibit the presence of more than two concurrent risk factors, while 34.04% of male patients exhibit the presence of more than three concurrent risk factors. A significant proportion of the patient population, specifically 62.14%, exhibited a high or extremely high risk of developing cardiovascular disease. This finding indicates that a majority of young and middle-aged patients diagnosed with hypertension face an elevated risk of cardiovascular complications. Moreover, the observed high-risk status of these patients is not promising, giving rise to concerns (Li et al., 2022).

Literature Review

In their study, Sun Ge et al. discovered that engaging in prolonged aerobic exercise among female college students can lead to improvements in the body's energy supply capacity from body fat, resulting in significant reductions in physical composition and a decreased risk of cardiovascular diseases. This holds certain positive implications. Shi Yali et al. conducted a longitudinal study involving the implementation of Tai Chi exercises for the elderly population. The study revealed that the mean blood glucose concentration prior to engaging in Tai Chi training was measured at +/L. Following the training, the blood glucose concentration was observed to be +/L. However, it is worth noting that the levels of triglyceride (TG), total cholesterol (TC), and low-density lipoprotein (LDL) exhibited an increase. There was a significant decrease observed in the levels of high-density lipoprotein (HDL), while there was a significant increase in the levels of insulin. The observed values were found to be notably lower in comparison to the control group. Persistent hypertension is a significant risk determinant for numerous cardiovascular ailments and exerts detrimental effects on various organ systems, including the heart, brain, and kidneys, ultimately culminating in organ failure. The mean lifespan of individuals diagnosed with hypertension was observed to be significantly reduced by a range of 15 to 20 years in comparison to the general population. According to the World Health Organisation (WHO), it is projected that hypertension will emerge as the leading global ailment within the next five to 10 years. Additionally, the WHO forecasts that by 2022, non-communicable diseases, including cardiovascular diseases, will be responsible for 79% of mortality cases in China. China is a nation characterised by a notable prevalence of hypertension. Currently, the number of individuals diagnosed with hypertension in China stands at approximately 130 million. The prevalence of hypertension in China has been observed to increase steadily over the years, as evidenced by three national sampling surveys conducted since the establishment of the People's Republic of China, along with several large-scale epidemiological studies conducted in recent years. However, it is concerning that the awareness rate, treatment rate, and control rate of hypertension remain significantly low. Consequently, it is imperative that efforts to prevent and treat hypertension are not delayed. Psychosocial factors, including individual stress state, emotion, personality characteristics, psychological defence mechanisms, and social support systems, have been found to influence the development and progression of hypertension. There is a prevailing consensus, both domestically and internationally, that the occurrence of stressful life events, particularly those that induce stress and anxiety, can heighten the likelihood of developing hypertension. The clinical management and intervention of psychosomatic disorders have garnered considerable interest among individuals. Currently, there is a lack of proficiency among clinicians in Chinese general hospitals when it comes to identifying mental disorders, particularly among medical personnel in basic hospitals who possess a limited understanding of psychosomatic illnesses. The implementation of healthcare system reform in China has led to an enhancement in the performance of the community health service network. However, it is important to note that there remains a relative scarcity of health resources. The effective prevention and treatment of hypertension remain a persistent and challenging endeavour in the realm of community-based chronic disease prevention and treatment (Pakaya & Hidayat, 2022). According to the data presented in Figure 1:

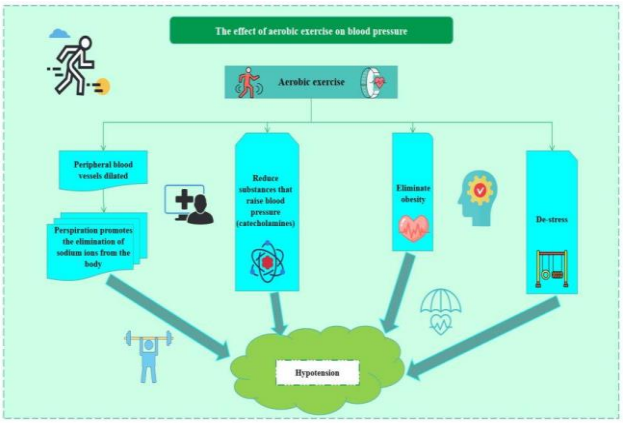

Figure 1. The effect of aerobic exercise on hypertension.

Research Methods

A total of 92 individuals diagnosed with hypertension were allocated into two groups based on digital criteria: a control group consisting of 46 participants and a study group also consisting of 46 participants. Both cohorts received a combined drug treatment, while the study group additionally engaged in aerobic exercise as an adjunctive intervention. The researcher employed the Self-Assessment Scale (SAS) to assess levels of anxiety, and the Health Questionnaire (MOSSF36) to evaluate quality of life in both experimental groups prior to and following a 10-week treatment period. In the interim, a comparison was made between the two groups regarding various biomarkers including total fat (TC), triacylglycerol (TG), high-density lipoprotein (HDL-C), low-density lipoprotein (LDL-C), fast blood glucose (FPG), insulin (FINS) levels, insulin sensitivity index (ISI), systolic blood pressure (SBP), and diastolic blood pressure (DBP). Between January 2020 and January 2022, a total of 80 individuals diagnosed with hypertension were enrolled in the study and subsequently allocated into two groups, namely the experimental group and the control group, in accordance with the prescribed guidelines. Each group consisted of 40 patients. The research team consisted of 26 men and 14 women; Age ranged from 35 to 67 years, with an average of (46.55 ± 4.72) years; and the course of the disease is 1-10 years, on average (4.38 ± 0.86) years; 19 cases of grade I fractures and 21 cases of grade II fractures; Body mass (BMI) 20 ~ 28 kg / m2, average (25.49 ± 2.84) kg / m2; There are 14 elementary school students, 15 middle school students, and 11 middle school students. The management team consists of 25 men and 15 women; Age ranged from 35 to 70 years, with an average of (46.50 ± 4.68) years; and the course of the disease is 1-10 years, on average (4.43 ± 0.85) years. 18 people with high blood pressure and 22 people with high blood pressure; Body mass index 20 ~ 29 kg / m2, average (25.71 ± 2.65) kg / m2; There are 15 elementary school students, 16 middle school students, and 9 middle school students. Regarding the normal data, there is no difference between the two groups (P & gt; 0.05), which is significantly increased. The study was approved by the hospital's medical committee, and all patients signed a consent form.

The methodology encompasses the following criteria: (1) The main criterion for hypertension diagnosis is based on clinical analysis, specifically excluding the use of antihypertensive medication. It involves measuring the blood pressure in the conference room on the third day, where a systolic blood pressure of ≥ 140 mmHg and/or a diastolic blood pressure of ≥ 90 mmHg is observed. (2) The age range of the participants is limited to individuals between 18 and 70 years old. (3) The physical condition of the participants is taken into consideration. (4) Participants are required to have attained at least a primary education level or higher. (5) The study involves the recruitment of volunteers who willingly choose to participate. The topic of discussion pertains to separation procedures. The inclusion criteria for this study are as follows: (1) Patients with secondary hypertension and severe hypertension (systolic hypertension ≥ 180mmHg or diastolic hypertension ≥ 110mmHg); (2) Patients with cardiac, hepatic and renal insufficiency; (3) Individuals with severe mental illness who experience communication difficulties; (4) Patients with a documented history of surgery, severe trauma, or significant life-threatening events within the preceding 6 months (Xi et al., 2022).

Method

All participants received treatment with standard antihypertensive medications, and they were provided guidance on adopting healthier lifestyle practises, including smoking cessation, adherence to a low-fat and low-salt diet, and abstaining from alcohol consumption. Based on this rationale, the research team implemented an augmented regimen of aerobic exercise, primarily incorporating brisk walking, jogging, and other athletic modalities. Additionally, they opted to conduct these activities in environments characterised by elevated oxygen density, such as a forest park abundant in negative ions. In the initial week, the duration of each exercise session is set at 30 minutes. Subsequently, during the second week, the duration of each exercise session is incremented by 10 minutes. The maximum time allocation per session is 60 minutes, with a frequency of four sessions per week, and a total duration of 10 weeks. The determination of exercise intensity is based on the reserve heart rate. The GE Marquette CASE ECG exercise test system is utilised to measure the patient's maximum heart rate and resting heart rate. The expression "maximum heart rate minus resting heart rate" refers to the difference between an individual's maximum heart rate and their resting heart rate. The reserve heart rate is determined by adding the intensity percentage to the resting heart rate. During the initial week, the prescribed exercise intensity was set at 60% of the reserve heart rate. Starting from the second week, the exercise intensity was progressively augmented by 5% during subsequent sessions, taking into account the patient's physical capacity and physiological response. However, the upper limit of exercise intensity did not exceed 80%. Throughout the exercise intervention, there was no alteration made to the patient's pre-existing lifestyle and dietary habits. There are no additional

stringent criteria for the antihypertensive medications administered to the two cohorts of patients, and the initial medication regimen is upheld (Ismail, 2022).

Observation Indicators

(1) Heart rate and blood pressure: The study involved the measurement of heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) in patients both before and after the intervention. The researchers obtained the average values of these parameters from three consecutive tests, with each test being conducted at intervals of 2 to 3 minutes. 2) Health behaviour: Measurements were taken once a week throughout the duration of the intervention. In this study, the researchers evaluated a total of 52 health behaviours across six dimensions, namely self-awareness, stress management, social responsibility, physical activity, nutrition support, and social use of the Health Promotion System II (HPLP-II). Utilise the Link4 platform for scoring purposes. The scores and total scores for each dimension are divided by the total number of items in order to obtain the average score. Greater scores are indicative of improved health habits. A minority of participants, specifically 2.5%, held the belief that health behaviour fell within an intermediate range. It is advisable to monitor the situation both prior to and subsequent to the implementation of the intervention. 3) Psychological stress level: The level of psychological stress was assessed using the Chinese Perceived Stress Scale (CPSS), which consists of 14 items divided into two dimensions: control and tension. According to Linker's 5-point score, the scores range from 1 to 5, indicating the absence of a score to a normal score, respectively. The scores of the sense of control dimensions were represented by items 4, 5, 6, 7, 9, 10, and 13, while the remaining scores corresponded to the sense of tension. The range of total scores spans from 14 to 70 points. Greater scores correspond to higher scores. It is recommended to conduct monitoring both prior to and subsequent to the implementation of an intervention. 4) In order to assess the levels of angiotensin II (Ang II), endothelin-1 (ET-1), and superoxide dismutase (SOD) in the bloodstream, a sample of 5 ml of fasting elbow blood was collected from patients before and after the intervention. Subsequently, the supernatant was obtained through the process of centrifugation. The levels of Angiotensin II (Ang II), Endothelin-1 (ET-1), and Superoxide Dismutase (SOD) were measured. The radioimmunoassay technique is employed to measure Angiotensin II (Ang II) levels, while the Ding method is utilised for Superoxide Dismutase (SOD) analysis. Additionally, the nitrate reductase method is employed to quantify Endothelin-1 (ET-1) concentrations (Latifi, Mardani, & Ghareghani, 2022).

Result Analysis

Heart Rate and Blood Pressure Level

In comparison to the pre-intervention period, the heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) exhibited significant decreases in both groups following the intervention. Moreover, the observation group demonstrated lower values than the control group, with a statistically significant difference (P<0.05). Please refer to Table 1.

Table 1

Comparison of heart rate and blood pressure between two groups of hypertensive patients before and after intervention($\bar{x} \pm s$)

Group	Number of cases	HR (time/min)		SBP (mmHg)		DBP (mmHg)	
		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Observation group	40	83.74 ± 6.59	72.32 ± 5.61 a	152.67 ± 21.42	127.35 ± 13.40 a	105.63 ± 12.40	90.75 ± 8.31 a
Control group	40	83.55 ± 6.62	76.88 ± 5.74 a	150.15 ± 20.79	135.28 ± 15.01 a	105.44 ± 12.38	95.26 ± 8.50 a
t value		0.129	3.596	0.534	2.493	0.069	2.4
P value		0.898	0.001	0.596	0.015	0.947	0.019

Note: compared with that before intervention, aP < 0.05

Healthy Behaviour

In comparison to the pre-intervention period, the observation group exhibited a significant increase (P < 0.05) in HPLP - II subscale scores and total scores following the intervention. Conversely, the control group experienced an increase in five self-awareness subscale scores and total scores. Specifically, stress management, health responsibility, nutritional support, and interpersonal relationships showed a statistically significant increase (P<0.05), while there was no significant change in sports behaviour scores (P>0.05). The term "score" refers to a numerical value assigned to assess or evaluate something, often the experimental group exhibited significantly higher scores on each scale as well as the total score, in comparison to the control group (P<0.05). Please refer to Table 2.

Table 2

Comparison of HPLP - II scores between two groups of hypertensive patients before and after intervention (point, $\bar{x} \pm s$)

Group	Number of cases	self-realization	Stress management	Health responsibility	Sports behaviour	Nutrition support	Interpersonal relationship	Total score
Observation group	40							
Before intervention		1.54 ± 0.43	1.69 ± 0.28	1.78 ± 0.34	1.70 ± 0.54	1.42 ± 0.29	1.53 ± 0.32	1.61 ± 0.58
After intervention		2.63 ± 0.65ab	2.45 ± 0.50 ab	2.97 ± 0.55 ab	2.88 ± 0.64 ab	2.35 ± 0.61 ab	2.75 ± 0.70 ab	2.67 ± 0.75 ab
control group	40							
Before intervention		1.55±0.38	1.67 ± 0.30	1.76 ± 0.35	1.68 ± 0.53	1.45 ± 0.31	1.56 ± 0.30	1.61 ± 0.57
After intervention		2.02 ± 0.57a	1.95 ± 0.49a	2.14 ± 0.41a	1.87 ± 0.49	1.77 ± 0.45 a	2.03 ± 0.57 a	1.96 ± 0.63a

Psychological Pressure

In comparison to the pre-intervention period, the CPSS scores and total scores of all indexes in both groups exhibited a decrease following the intervention. Notably, the changes observed in the observation group were more statistically significant (P<0.05). Please refer to Table 3 and Figure 2.

Table 3

Presents a comparative analysis of the CPSS scores among two distinct cohorts of hypertensive patients, both prior to and subsequent to the implementation of an intervention (Point, $\bar{x} \pm s$)

Group	Number of cases	Sense of loss of control		Tension		Total score	
		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Observation group	40	22.15 ± 3.42	15.67 ± 3.11a	25.06 ± 4.24	17.86 ± 3.20 a	47.21 ± 5.78	33.53 ± 4.62a
Control group	40	22.40 ± 3.56	19.85 ± 3.49 a	25.24 ± 4.38	21.33 ± 3.58 a	47.64 ± 5.75	41.18 ± 4.32 a
t value		0.321	5.655	0.187	4.571	0.334	5.65
P value		0.749	< 0.001	0.852	< 0.001	0.739	< 0.001

Note: compared with that before intervention, aP < 0.05

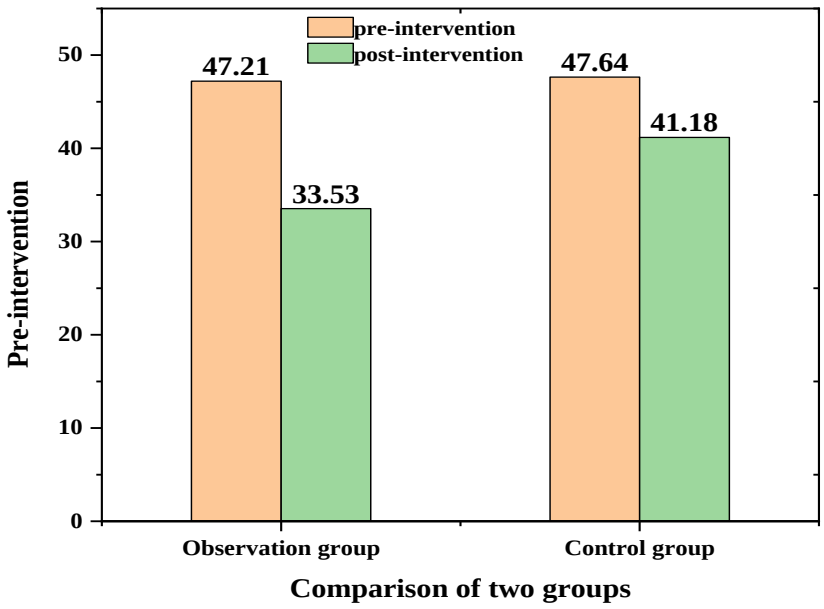

Figure 2. Total CPSS score of two groups of hypertensive patients before and after intervention.

Serum Ang II, ET-1 and SOD levels

Following the intervention, there was a notable decrease in the levels of serum Ang II and ET-1 in both groups, accompanied by an increase in the levels of SOD (P<0.05), as compared to the levels observed prior to the intervention. The observed changes in the group under observation were found to be statistically significant, with a significant difference observed (p < 0.05). Please refer to Table 4.

Table 4

Presents a comparison of serum Angiotensin II (Ang II), Endothelin-1 (ET-1), and Superoxide Dismutase (SOD) levels between two groups of hypertensive patients before and after intervention ($\bar{x} \pm s$)

Group	Number of cases	AngII(ng/L)		ET-1(μg/ml)		SOD(U/ml)	
		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Observation group	40	58.59 ± 5.84	50.19 ± 4.62a	81.47 ± 9.61	63.11 ± 7.28a	62.52 ± 5.36	85.68 ± 9.78a
Control group	40	58.44 ± 5.91	55.16 ± 4.86a	80.97 ± 9.50	70.35 ± 7.47a	62.55 ± 5.40	70.64 ± 7.03a
t value		0.114	4.693	0.234	4.393	0.025	7.903
P value		0.909	< 0.001	0.816	< 0.001	0.98	< 0.001

Note: Compared with before intervention, aP < 0.05

Exercise has been found to have an impact on various aspects of blood pressure, including systolic blood pressure, diastolic blood pressure, and the difference between the two. Specifically, it has been observed that the rise in systolic blood pressure during exercise tends to be greater than the increase in diastolic blood pressure, leading to a notable discrepancy between the two values. There is an observed increase in the disparity among patients, alongside an enhancement in the cardiovascular performance of the coronary blood vessels. Enhancing lifestyles has the potential to mitigate, manage, and regulate hypertension, a condition that can be transmitted. Physical activity, particularly aerobic exercise, holds considerable significance as a non-pharmacological intervention for individuals diagnosed with hypertension. It has been observed to yield a notable antihypertensive impact, particularly in patients presenting with mild hypertension. Fruit possesses the capacity to concurrently regulate body weight, diminish blood lipid levels, and enhance metabolic functioning. This paper aims to elucidate the underlying mechanism by which exercise exerts its blood pressure-lowering effects, as well as highlight the clinical research significance of this phenomenon. In order to establish a conceptual framework for the proactive mitigation of cardiovascular diseases through exercise.

Discussion

With the escalation of competition within society, the advent of an ageing population, and the enhancement of individuals' lifestyles, it is anticipated that there will be a rise in the prevalence of high blood pressure among the populace. Patients with high blood pressure often experience fear and anxiety as a result of inadequate diagnosis, the potential for sudden death, and the presence of chronic diseases. Consequently, individuals with high blood pressure face significant repercussions in terms of mental health disorders, including depression and anxiety. The aforementioned. The research revealed that the occurrence of depression and anxiety among individuals of societal significance was 11.11% and 30.16%, respectively. The incidence of depression and anxiety exhibited a higher magnitude compared to the control group. Additionally, there was an observed elevation in scores on the HAMD and HAMA scales. The primary characteristics of the HAMD include anxiety, somatization, significant alterations, cognitive decline, diurnal fluctuations, reduced speed, sleeplessness, and depressive symptoms. Significant differences were observed between the two groups in terms of baseline scores for anxiety/somatization, cognitive impairment, diurnal variation, and sleep, with these scores being significantly higher in the experimental group compared to the control group; No significant differences were observed between the two groups in terms of changes in severity, delay, or shock. Two significant components of HAMA, namely physical stress and mental stress, exhibited higher mean scores compared to the control group, particularly in relation to mental stress. This observation indicates that individuals within the community who have hypertension may experience negative emotions such as depression and anxiety. The presence of positive correlations between scores on the Hamilton Depression Rating Scale (HAMD) and the Hamilton Anxiety Rating Scale (HAMA) with patients' systolic and diastolic blood pressure suggests that levels of depression and anxiety have an impact on the magnitude of blood pressure fluctuations (Gwotmut, 2022).

The presence of depression and anxiety constitutes significant risk factors for the development of hypertension, and also has a notable impact on the efficacy of hypertension treatment and the overall prognosis of the condition. In individuals with essential hypertension and comorbid depression, anxiety, and emotional disorders, the presence of stress triggers an elevation in catecholamine secretion and platelet aggregation. These physiological responses contribute to an increase in blood viscosity, the promotion of vasoconstriction, and

ultimately, an elevation in blood pressure. Patients with anxiety frequently exhibit heightened levels of concern regarding their illness, leading to a state characterised by heightened tension and anxiety. Depression is associated with an increased likelihood of patients exhibiting resistance towards medical activities, displaying a lack of willingness to closely collaborate with medical personnel, and demonstrating suboptimal adherence to prescribed medication regimens. Depression and anxiety frequently contribute to the adoption of unhealthy lifestyles, including smoking, alcohol abuse, and engaging in persistently demanding and stressful work, all of which can adversely impact the regulation of blood pressure. The patients in the community who are diagnosed with hypertension exhibit evident symptoms of comorbid emotional disorders, specifically depression and anxiety. Depression and anxiety exert significant influence on the onset and progression of the disease, as well as the overall trajectory of the disease and the efficacy of antihypertensive treatment. In order to ameliorate symptoms of depression and anxiety, it is recommended to administer negative emotional intervention alongside suitable antidepressant and anxiolytic medications, if deemed necessary. This therapeutic approach has been observed to yield favourable outcomes in terms of blood pressure regulation (Johansson et al., 2022).

Hypertension is a prevalent chronic ailment in China, yet there exists a notable deficiency in the general populace's understanding, management, and regulation of the condition. To enhance the prevention and management of hypertension, it is imperative to implement a comprehensive range of interventions. These interventions encompass the dissemination of health information, administration of drug therapy, provision of psychological counselling, offering dietary guidance, promoting moderate alcohol consumption, and encouraging regular exercise. The present study integrates diverse health education strategies with personalised aerobic exercise as an intervention. The foundation of comprehensive health education encompasses the patient's individual capacities, personality traits, and emotional state. This approach aims to cultivate the patient's capacity and motivation for recuperation, followed by the dissemination of information pertaining to hypertension through various mediums such as publications, articles, lectures, and other educational resources. In essence, the intervention involves the application of pharmacological therapies, dietary alterations, and lifestyle adaptations. This observation further substantiates the existing pattern. Principles for Attaining Objectives in Health Education Customised aerobic exercise can be personalised for patients by considering their individual oxygen analysis and level of confidence in the advantages of physical activity. The findings indicated that following the intervention, the experimental group exhibited lower levels of HR, SBP, and DBP compared to the control group. This suggests that the integration of health education and personal aerobic exercise may enhance the efficacy of blood pressure reduction in patients (Tan et al., 2022).

Existing research indicates that engaging in optimal health behaviours, such as refraining from smoking, maintaining a balanced diet, managing weight, and engaging in regular exercise, can effectively mitigate the risk of developing hypertension. Moreover, it is worth noting that these health behaviours not only contribute to improved physical well-being but may also have a positive impact on work productivity. However, it enhances the efficacy of blood pressure regulation. The findings of this study revealed that the experimental group exhibited higher scores in HPLP-II and total scores compared to the control group. These results suggest that the integration of health education and individual exercise can effectively enhance the health behaviour of patients. Examine the underlying factors. This pertains to the dissemination and administration of information regarding health. Furthermore, the implementation of individualised aerobic exercise programmes will consider variations in physical fitness levels and aim to establish an optimal exercise setting that caters to the needs of all individuals. The findings of this study indicate that the experiment group, which received a combination of health education and aerobic exercise, exhibited lower levels of control sensitivity, tension, and total score of the CPSS compared to the control group. These results suggest that the intervention of health education and aerobic exercise may have a beneficial effect in reducing blood pressure among patients. Numerous clinical studies have demonstrated that behavioural intervention has the potential to mitigate patients' pain, decrease the severity of emotional disorders, and enhance treatment effectiveness (Jayedi, Emadi, & Shab-Bidar, 2022).

Research has demonstrated a correlation between the emergence and advancement of hypertension and various physiological systems, including muscle cells, the endocrine system, the renin-angiotensin system (RAS), the endothelial system (ET), and the immune system. Angiotensin II (Ang II) is synthesised upon activation of the renin-angiotensin system (RAS). The site of blood clotting can be directly affected, exerting a comprehensive influence on the entire body. ET-1, a biologically active compound synthesised by endothelial cells, plays a crucial role in regulating vascular smooth muscle contraction and

stimulating the growth and hypertrophy of blood vessels. Additionally, superoxide dismutase (SOD), an antioxidant enzyme, is produced during aerobic exercise and is closely associated with physical activity. This study conducted a comparative analysis of the blood concentrations of Angiotensin II (Ang II), Endothelin-1 (ET-1), and Superoxide Dismutase (SOD) in the two experimental groups. The experimental group exhibited lower levels of Ang II and ET-1 compared to the control group while demonstrating higher levels of SOD in comparison to the control group. The findings indicate that the concurrent implementation of health education and self-directed aerobic exercise can lead to a decrease in the levels of Ang II and ET in the bloodstream, while simultaneously promoting an increase in the expression of SOD. The potential mechanisms can be described as follows: (1) Engaging in independent aerobic exercise has been shown to enhance bodily function by augmenting the levels and efficacy of antioxidants, thereby mitigating the risk of developing hypertension. (2) Individual aerobic exercise stimulates various physiological systems, leading to increased production and efficacy of vasodilators, while simultaneously reducing vasoconstrictors such as Ang II and ET-1, ultimately resulting in a decrease in blood pressure (Hutchinson & Goosey-Tolfrey, 2022).

Several studies have demonstrated a positive correlation between psychological stress and an increase in Angiotensin II (Ang II) levels, thereby potentially contributing to the development of hypertension. The presence of vascular endothelial dysfunction is strongly associated with the development of cardiovascular diseases, and a majority of individuals with hypertension exhibit vascular endothelial dysfunction during the initial phases. According to research findings, the presence of behavioural stress has been observed to elicit a heightened release of vasoactive substances, consequently resulting in an elevation of ET-1 levels. Nitric oxide (NO) serves the purpose of inducing vasodilation. In a state of homeostasis, nitric oxide (NO) and endothelin-1 (ET-1) maintain equilibrium and collaboratively govern the processes of vasodilation and vasoconstriction. When the concentration of nitric oxide (NO) decreases, there is a corresponding increase in the concentration of endothelin-1 (ET-1), leading to the development of vascular endothelial dysfunction, abnormal vasoconstriction, and the subsequent onset of hypertension. When there is an increase in psychological pressure, it leads to the activation of sympathetic nerves and the direct or indirect activation of the Reticular Activating System (RAS). Within the Renin-Angiotensin System (RAS), the enzyme known as plasma renin activity (PRA) plays a crucial role in facilitating the conversion of angiotensinogen into angiotensin. Subsequently, angiotensin is further transformed into Angiotensin II (Ang II) through the action of angiotensinase. The presence of Ang II enhances the sensitivity of the vascular angiotensin receptor to sympathetic nerve stimulation. Angiotensin II (Ang II) functions as a vasoconstrictor by binding to the type I receptor (AT1R) located on the vascular wall. This binding event promotes vasoconstriction. Additionally, Ang II stimulates the release of other vasoconstrictive factors, including endothelin-1 (ET-1) and prostaglandins. Furthermore, Ang II increases the expression of endothelin, thereby amplifying the contraction response induced by Ang II. According to reports, angiotensin II (Ang II) has been found to induce vascular endothelial dysfunction through the mediation of angiotensin II type 1 receptor (AT1R).

In conclusion, the implementation of a comprehensive health education programme, supplemented with individualised aerobic exercise, demonstrates a clear antihypertensive effect among patients diagnosed with hypertension. This intervention significantly enhances patients' health-related behaviours and alleviates psychological stress, potentially attributed to the reduction in serum levels of Angiotensin II, Endothelin-1, and Superoxide Dismutase.

Conclusion

Hypertensive diseases can be attributed to elevated hormone levels, increased blood lipid concentrations, and reduced nitric oxide levels within the body. The phenomenon can be attributed to various underlying factors of lesser magnitude. Aerobic exercise interventions of extended duration have been shown to have a positive impact on both systolic and diastolic blood pressure in individuals with hypertension. The blood lipids experienced a notable reduction, accompanied by a significant decrease in plasma endothelin levels. This led to an improvement in blood sugar levels in conjunction with nitrogen oxide water, ultimately contributing to the maintenance of a relatively stable blood pressure within the body. The availability of high-fat, high-protein, and high-sugar foods has increased in tandem with the enhancement of our population's living conditions. Alongside the advancement of contemporary industrialization, there has been a notable decline in individuals' physical activity, leading to a steady rise in the prevalence of hypertension over time. Elderly individuals diagnosed with hypertension exhibit limited tolerance and are unable to engage in prolonged and vigorous exercise

regimens. Simultaneously, it has been observed that patients undergoing treatment often experience adverse emotional states, including anxiety and irritability, which subsequently contribute to elevated blood pressure levels. Hence, selecting a suitable exercise modality holds significant importance in the context of preventing and managing hypertension in elderly patients. Aerobic exercise has the potential to augment energy expenditure and exert a substantial influence on lipid metabolism.

The results of this study indicate that engaging in aerobic exercise among elderly individuals with hypertension can be a viable approach to diminishing anxiety levels and enhancing their overall zest for life. The primary reason for this is that engaging in physical activity can contribute to patients achieving a positive and satisfactory outcome, fostering the healthy progression of emotional well-being, and subsequently enhancing the alleviation of anxiety. The implementation of aerobic exercise has been found to have a substantial positive impact on the overall well-being of elderly individuals diagnosed with hypertension. The disease itself has a significant impact on both PF and RP scores, resulting in subtle changes in scores following treatment. Subjective indicators such as GH (General Health), VT (Vitality), RE (Role Emotional), and MH (Mental Health) scores are frequently associated with the extent to which individual needs are fulfilled, thus serving as measures of quality of life. Following a regimen of aerobic exercise training, individuals have the potential to alleviate the psychological distress associated with discomfort and monotony in daily life. This can lead to notable enhancements in their mental well-being and subjective experiences, ultimately resulting in an improved overall quality of life. The findings of this study additionally demonstrated that aerobic exercise can lead to improved regulation of blood lipids in individuals with hypertension. The primary reason for this phenomenon is that engaging in aerobic exercise has been shown to greatly enhance the muscle tissue's capacity to uptake and metabolise non-esterified fatty acids, as well as improve the functioning of lipoproteins within the muscles. Consequently, this leads to a notable increase in high-density lipoprotein cholesterol (HDL-C) levels, while simultaneously causing a significant decrease in total cholesterol (TC) and triglyceride (TG) levels. As a result, the beneficial impact of aerobic exercise on lipid reduction becomes evident. The term "ISI" is frequently employed to characterise the extent of insulin resistance. A decrease in the Insulin Sensitivity Index (ISI) is associated with a corresponding increase in the negative impact of a given unit of insulin. The higher the degree of carbohydrate decomposition, the more likely it is to result in hyperglycaemia. The study group exhibits a higher ISI compared to the control group, suggesting that elderly hypertensive patients can effectively lower their blood pressure and blood sugar levels through adherence to aerobic exercise. This finding aligns with the research findings of Ge Wangang and other scholars. The aforementioned reasons will now be examined. (1) Regular aerobic exercise engages the muscles of the entire body, and exercise training has been shown to mitigate the influence of sympathetic nerves, enhance the activity of vagus nerves, and subsequently decrease blood pressure levels. (2) Patients who engage in regular aerobic exercise experience a decrease in their resting heart rate, a reduction in plasma catecholamine levels, an increase in prostaglandin E levels, and subsequent decreases in peripheral vascular resistance, vascular dilation, and vascular contraction stress. These physiological changes collectively contribute to the desired outcome of lowering blood pressure. Aerobic exercise has been shown to enhance the utilisation rate of glucose in patients, facilitating its conversion into the energy required by the human body. Additionally, it has been observed to augment the intake of glucose by insulin (FINS) and subsequently decrease blood sugar levels.

In the end, engaging in aerobic exercise has been found to yield notable benefits for elderly individuals with hypertension. Specifically, it has been observed to effectively alleviate anxiety symptoms, enhance overall quality of life, and exert positive influences on blood pressure, blood lipids, and blood glucose levels.

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