

PREVENTION, PHYSICAL THERAPY AND REHABILITATION OF HYPERTENSION

Vasileios Politis* Galina Mratskova**

** Medical Student, 4-th year, Faculty of Medicine, Trakia University, 11 „Armeiska“ Str., 6000, Stara Zagora, Bulgaria; E-mail: vasileios.politis.21@trakia-uni.bg*

*** Department of Physical and Rehabilitation Medicine and Sports, Faculty of Medicine, Trakia University, 11 „Armeiska“ Str., 6000, Stara Zagora, Bulgaria; E-mail: doc_mratzkova@abv.bg*

Abstract

Introduction: Hypertension is proven to be one of the leading causes of morbidity and mortality worldwide. It is a primary risk factor for numerous cardiovascular diseases, as it doubles the risk of CHD (Coronary Heart Disease), CHF (Coronary Heart Failure) and peripheral arterial disease (PAD) appearance. Physical therapy has an important role regarding prevention of hypertension, especially in people who belong to groups of high risk. Physical therapy is applied mostly in first and second stage of the disease. **The purpose** of this review report is to explore the possibilities for prevention, treatment and rehabilitation through the application of therapeutic approaches from Physical and Rehabilitation Medicine. **Materials and methods:** We conducted a review of available scientific sources in Google Scholar, Pubmed, Science Direct and other scientific databases, which included reports, scientific randomized trials, prospective controlled trials, guidelines for prevention, treatment and rehabilitation in patients at risk and already suffering from hypertension. **Results:** Our review of the scientific literature found evidence for the possible benefits of natural and modified physical factors application against hypertension. **Conclusion:** Potentially effective strategies for prevention, treatment and rehabilitation in patients with hypertension include: aerotherapy, sunbathing, hydrotherapy, spa, therapeutic massage and physiotherapy, which mainly refers to therapeutic gymnastics. Regular exercise can also function as a preventive factor against hypertension. Slow Stroke Back Massage is also considered as a physical therapy practice, which combats headache occurrence as a symptom of hypertension.

Key words: *Hypertension, prevention, rehabilitation, natural physical factors, therapeutic exercises*

Introduction

Hypertension is a sustained elevation of blood pressure (BP) within arterial circuit (systolic BP values of 130 mmHg and more, diastolic BP values of 80 mmHg and more). It is a primary risk factor for numerous cardiovascular diseases, as it doubles the risk of coronary heart disease (CHD), coronary heart failure (CHF) and peripheral arterial disease (PAD) appearance. Hypertension is also one of the leading causes of morbidity and mortality worldwide [1-3].

Hypertension is a common disease in modern societies (26% of global population is estimated to suffer from hypertension). However, people from isolated communities may remain unaffected [2, 4]. Populations which have special considerations in terms of diagnosis and management of hypertension are mostly pregnant women, children, adolescents and elder people. In the United States, African American populations are also included in the special considerations category, as long as they have the tendency to develop hypertension at earlier ages, as long as it is proven to be less aware of hypertensive diseases. Therefore, they have higher rates of morbidity and mortality from cardiovascular diseases [2, 4].

Hypertension can be characterized as two main types: primary or secondary, depending on its etiology. In contrast to secondary hypertension, where the cause is clearly visible, primary hypertension does not have an identifiable and specific cause [2]. **Primary hypertension – risk factors** Primary hypertension appearance is based on risk factors, which are divided into non-modifiable and modifiable. The group of non-modifiable risk factors includes: Age (more common in adults than in children, likelihood increases with increasing age); Racial affiliation (more common in people of African-American descent, according to studies in North America, especially the United States) [5]; Gender (more likely to occur in females than males); Family history, genetics [3].

Modifiable risk factors are: Dietary factors; Dyslipidemia (atherosclerotic plaques lead to increased resistance in blood flow, resulting in blood pressure rise); Alcohol consumption; Fitness level (higher level of fitness are related with lower blood pressure levels and decreased cardiovascular diseases risk); Obesity [3].

Secondary hypertension – main causes. Secondary hypertension (SH) may occur due to numerous causes on which elevated blood pressure is secondary. These are the following:

Secondary hypertension is often caused by certain diseases of the renal parenchyma. It can be found in patients with long-standing diabetes who have diabetic nephropathy, in patients with polycystic kidney disease, diseases and pathologies of the glomeruli, etc. [6-8]. Atherosclerotic renal artery stenosis may cause secondary hypertension as well, being the most prevalent renovascular disease type [9]. Endocrine disorders in which there is increased secretion of hormones can also cause secondary hypertension [7, 8]. Characteristic examples of such disorders are pheochromocytoma (tumor causing serious hypertensive crises), Cushing's syndrome (excess glucocorticoid levels disorder) and primary aldosteronism (related to excess aldosterone production due to adrenocortical hyperplasia). Vascular disorders: prime example is coarctation of the aorta (congenital condition in which there is narrowing of the aorta). Drug-induced hypertension: significant secondary hypertension cause. A great variety of drugs may cause hypertension, such as NSAIDs (Non-Steroid Anti-Inflammatory Drugs), anti-depressants (tricyclic antidepressants and monoamine oxidase inhibitors), oral contraceptives and immunosuppressants (i.e: cyclosporine) [10, 11]. Obstructive sleep apnea (OSA) can be also considered as a secondary hypertension cause, due to increased activity of sympathetic nerve system and changes in renin-angiotensin-aldosterone system (RAAS) [9].

The diagnosis is made after consecutive blood pressure measurements showing a persistent increase in pressure. If on two consecutive days the systolic blood pressure is 140 mmHg or higher and the diastolic pressure is 90 mmHg or higher, hypertension can be diagnosed [1, 12, 13]. In addition, medical history of the patient is also taken into account when information which strongly indicates a hypertension case is mentioned (e.g: dietary factors, fitness level, family history regarding cardiovascular diseases) [14].

Treatment of hypertension requires a proper disease management strategy. Treatment depends on the individual characteristics of the patient, and the following interventions may be included in the overall therapeutic plan: Lifestyle modifications: some examples of these modifications are weight reduction (BMI < 25 kg/m² projected decrease of systolic blood pressure up to 20 mmHg), dietary salt reduction (<6g NaCl/day), physical activity (regular aerobic activity). Alterations in lifestyle may lead to a 15% reduction of any cardiovascular event [3]. Pharmacologic therapy: Drugs affecting Renin Angiotensin Aldosterone System (RAAS): ACE inhibitors (enalapril), AT-1 blockers (valsartan) [15], direct renin inhibitors; Sympathetic hypertone reducing drugs: Beta-blockers (selective and non-selective), alpha blocker, agonists of central α_2 -adrenoreceptors, agonists of imidazoline 1 receptors; Calcium antagonists: dihydropyridines, benzothiazepines, Diuretics: Thiazide, potassium-sparing diuretics [16, 17].

Physical therapy and rehabilitation has an important role regarding prevention of hypertension, especially in people who belong to groups of high risk. It is applied mostly in first and second stage of the disease.

The purpose of this review report is to explore the possibilities for prevention, treatment and rehabilitation through the application of therapeutic approaches from Physical and Rehabilitation Medicine.

Materials and Methods

We conducted a review of available scientific sources in Google Scholar, Pubmed, Science Direct and other scientific databases, which included reports, scientific randomized trials, prospective controlled trials, guidelines for prevention, treatment and rehabilitation in patients at risk and already suffering from hypertension. In scientific articles, we searched for results by keywords that included: arterial hypertension, high blood pressure, risk factors, pharmacological treatment, non-pharmacological treatment, prevention, rehabilitation, aerotherapy, sunbathing, spa therapy, hydrotherapy, physiotherapy, therapeutic gymnastics, therapeutic exercises, breathing exercises, physical activity, therapeutic massage.

Results and discussion

Through detailed review of the scientific literature, evidence was found for the possible benefits of applying natural and modified physical factors in hypertensive disease. The main target of physical therapy in hypertension (according to numerous scientific researches) is to monitor therapeutic effect in treatment of hypertensive patients. However, it is recommended that rehabilitation doctors should seek advice from treating cardiologist for assistance in management of each patient. In order to achieve this goal, there are two requirements: At first, pathogenic mechanisms which lead to hypertension should be influenced via improving neuro-psychological regulation through taking patient out of his home environment. In this way, imbalance between excitatory and inhibitory cortical processes is restored, including also improvement of neuro-vegetative regulation of cardiovascular system. The second requirement is stimulation of immune system. This can happen via cardiovascular system training, metabolism improvement and rehabilitation of blood vessels wall elasticity [18].

The plan proposed for physical therapy of hypertension includes the following methods. At first, climate can contribute in implementation of proposed plan. Some typical examples are: Aerotherapy, sunbathing, hydrotherapy, SPA [19-22]. Hydrotherapy can be used as an additional method to normalize blood pressure. The temperature of the water could have a positive effect and help normalize heart rate, reduce peripheral vascular resistance, control baroreceptor activity and the production and synthesis of certain hormones [23]. Regarding sunbathing, researches showed that sunlight exposure leads to transfer of NO amounts from skin to blood circulation, leading to drop of blood vessel tone, taking into account that NO contributes in blood pressure regulation [24]. Secondly, physiotherapy (which mostly refers to healing gymnastics), has a major impact on prevention and treatment of hypertension.

Relation of physical exercise with hypertension. This therapy has a better effect in the early stages of the disease, and therapeutic exercises can also have a preventive effect in hypertensive disease or borderline high blood pressure. Currently, there are reported results from a number of clinical studies that indicate that regular use of low- to moderate-intensity aerobic exercise can be effective in reducing blood pressure in patients with mild and moderate hypertension.

In fact, it is more preferable to perform this type of physical exercise in this case, as long as power exercises (which include resistance training) related with exertion and holding breath should be avoided in hypertension cases. Regular exercise can also function as a preventive factor against hypertension [25-27]. Depending on the stage of hypertensive disease, there are three exercise complexes with different duration. These are the following: First degree hypertension: 30-80 minutes of exercise; Second degree hypertension: 20-45 minutes of exercise; Third degree hypertension: 10-20 minutes of exercise. By this classification of complexes, it is clear that when blood pressure levels increase, the respective levels of physical activity should be decreased. In these cases, emphasis should be mostly given to pharmacologic treatment. In patients with third degree hypertension, it is

recommended that the exercises be performed at a slow pace with full amplitude for the purpose of complete muscle relaxation [19, 28].

In physiotherapy, breathing exercises, as part of the kinesitherapy program, play a crucial role in the fight against hypertension. It is even recommended in some cases that breathing exercises should be performed independently. In medical gymnastics complex, it is not desirable to include complex and asymmetric coordination exercises, which lead, eventually, to nervous system overstretching. Exercises related with sharp movements and bending of head are contraindicative for hypertensive patients [29].

For people with arterial hypertension, there are numerous recommended physical activities to practice depending on the hypertension grade. For hypertensive people on the first stage, some examples are volleyball, tennis, biking and swimming. On second stage, tennis and fishing are appropriate activities for these patients [30-34].

In rehabilitation and prevention programs for hypertension, it is also recommended to include **Slow Stroke Back Massage** therapy (SSBM) as an important method of physical therapy. A very common symptom in patients with hypertension is the appearance of sudden headaches. According to some researchers, the application of SSBM can effectively lead to a decrease in blood pressure [35]. SSBM therapy is proven to relieve hypertension through activation of parasympathetic nerves and endorphins work. In this way, blood flow becomes smoother due to vasodilation of blood vessels, as long as parasympathetic activity is present. Endorphins contribution in SSBM is important providing that they function as a natural analgesic for pain and as a result, reduction of headaches is achieved [36]. In addition, there are significant differences in systolic and diastolic pressure respectively before and after SSBM implementation (systolic pressure decrease: 6,44 mmHg and diastolic pressure decrease: 4,77 mmHg). Regarding SSBM technique itself, it is a direct skin-to-skin contact therapy which increases relaxation effect on the body. Massage may transfer signals to brain in order to decrease blood pressure. In this way, headache effects decrease and endorphin levels are increased. There is evidence from studies that systolic blood pressure can be reduced by an average of 10 mmHg after therapy with this massage. Therapy was implemented to the patients for a minimum of 3 days and it was done 2 times (morning and evening). Headache scale was reduced in all participants, as an evident result of the therapy procedure [36-38].

In conclusion: Potentially effective strategies for prevention, treatment and rehabilitation in patients with hypertension include: aerotherapy, sunbathing, hydrotherapy, SPA, therapeutic massage and physiotherapy, which mainly refers to therapeutic gymnastics. For better results, it is prescribed in the earliest stages of the disease. Regular exercise can also function as a preventive factor against hypertension. Slow Stroke Back Massage is also considered as a physical therapy practice, which combats headache occurrence as a symptom of hypertension.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. World Health Organization (WHO) 2023. Accessed August 18, 2025. <https://www.who.int/news-room/fact-sheets/detail/hypertension>
2. Kotchen TA. Hypertension. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson J. eds. Harrison's Principles of Internal Medicine, 21e. McGraw-Hill Education; 2022. Accessed August 14, 2025. <https://accessmedicine.mhmedical.com/content.aspx?bookid=3095§ionid=265454202>
3. Iqbal AM, Jamal SF. Essential Hypertension. [Updated 2023 Jul 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK539859/>

Science & Research

4. Albert W Dreisbach, Vecihi Batuman, FASN. Epidemiology of Hypertension. Available from: <https://emedicine.medscape.com/article/1928048-overview#a2>
5. Hegde S, Ahmed I, Aeddula NR. Secondary Hypertension. [Updated 2023 Jul 30]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK544305/>
6. Zilbermint M, Hannah-Shmouni F, Stratakis CA. Genetics of Hypertension in African Americans and Others of African Descent. *Int J Mol Sci.* 2019;20(5):1081. doi:10.3390/ijms20051081;
7. Vachek J, Zakiyanov O, Oulehle K, Ciferská H, Tesař V. Renoparenchymatózní hypertenze - aktuální v diagnostice a léčbě [Renal parenchymal hypertension: relevant new aspects]. *Vnitr Lek.* 2021;67(8):479-484.
8. Koch C, Papadopoulou-Marketou N, Chrousos GP. Overview of Endocrine Hypertension. [Updated 2020 Feb 4]. In: Feingold KR, Ahmed SF, Anawalt B, et al., editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK278980/>
9. Rimoldi SF, Scherrer U, Messerli FH. Secondary arterial hypertension: when, who, and how to screen?. *Eur Heart J.* 2014;35(19):1245-1254. doi:10.1093/eurheartj/ehf534
10. Borozan, S., Kamrul-Hasan, A.B.M., Shetty, S. et al. Approach to Endocrine Hypertension: A Case-Based Discussion. *2025 Curr Hypertens Rep* 27, 8. <https://doi.org/10.1007/s11906-025-01323-w>
11. Hegde S, Ahmed I, Aeddula NR. Secondary Hypertension. [Updated 2023 Jul 30]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK544305/>
12. Norris TL. Porth's Essentials of Pathophysiology, 5e. Lippincott Williams & Wilkins, a Wolters Kluwer business; 2020. Accessed August 14, 2025. <https://cornerstonepharmacy.lwwhealthlibrary.com/book.aspx?bookid=2938§ionid=0>
13. Campbell NRC, Paccot Burnens M, Whelton PK, et al. 2021 World Health Organization guideline on pharmacological treatment of hypertension: Policy implications for the region of the Americas. *Lancet Reg Health Am.* 2022; 9:100219. doi:10.1016/j.lana.2022.100219
14. Payeras A.C., Benito C.S., Babkowski M.C., Feria-Carot M.D. Diagnosis of High Blood Pressure Available from: <https://www.clinicbarcelona.org/en/assistance/diseases/high-blood-pressure/diagnosis-and-tests>
15. Related Harrison's Resources. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson J. eds. *Harrison's Principles of Internal Medicine*, 21e. McGraw-Hill Education; 2022. Accessed August 18, 2025. <https://accessmedicine.mhmedical.com/content.aspx?bookid=3095§ionid=265394579>
16. Miura S, Karnik SS, Saku K. Review: angiotensin II type 1 receptor blockers: class effects versus molecular effects. *J Renin Angiotensin Aldosterone Syst.* 2011;12(1):1-7. doi:10.1177/1470320310370852
17. Guideline for the pharmacological treatment of hypertension in adults. Geneva: World Health Organization; 2021.
18. Carey RM, Moran AE, Whelton PK. Treatment of Hypertension: A Review. *JAMA.* 2022;328(18):1849–1861. doi:10.1001/jama.2022.19590
19. *Essential Physical Medicine and Rehabilitation* Edited by Grant Cooper. Accessed August 18, 2025. <https://pubhtml5.com/ylgr/phyv/>
20. Krastev D., Petcov I., Krastev N., Kalniev M., Apostolov A. Treatment of arterial hypertension by physical methods. *Journal of IMAB - Annual Proceeding (Scientific Papers)* 2013, 19 (1): 402-404. DOI: 10.5272/jimab.2013191.402
21. Dogaru G, Radulescu A. Therapeutic effects of carbonated mineral Waters in cardiovascular rehabilitation. *Balneo Research Journal,* 2015; 6(1):36-39. <http://dx.doi.org/10.12680/balneo.2015.1083>

22. Moini Jazani A, Nasimi Doost Azgomi H, Nasimi Doost Azgomi A, Nasimi Doost Azgomi R. Effect of hydrotherapy, balneotherapy, and spa therapy on blood pressure: a mini-review. *Int J Biometeorol.* 2023;67(9):1387-1396. doi:10.1007/s00484-023-02512-5
23. Kanimozhi K.K Ravi P., Vijayakumar V., Kuppusamy M. Sauna bath reduces blood pressure in healthy adult volunteers: A meta-analysis of RCTs and quasi-experimental studies. *Advances in Integrative Medicine.* 2025; 12(1):2-6. <https://doi.org/10.1016/j.aimed.2024.09.009>
24. Feelisch M, Weller R. Here comes the sun to lower your blood pressure. Available from: <https://www.southampton.ac.uk/news/2014/01/20-the-sun-to-lower-your-blood-pressure.page>
25. Angraini R., Irwan AM, Arafat R. Effectiveness of Hydrotherapy to Lower Blood Pressure in Hypertensive Patients: A Systematic Review *International Journal of Caring Sciences.* 2023;16(3):1237
26. Gerage AM, Alberton CL, Cucato GG, Delevatti RS, Ritti-Dias RM. Editorial: Exercise intervention for prevention and management of hypertension. *Front Physiol.* 2023;14:1244715. Published 2023 Jul 4. doi:10.3389/fphys.2023.1244715
27. Kokkinos PF, Narayan P, Papademetriou V. Exercise as hypertension therapy. *Cardiol Clin.* 2001 Aug;19(3):507-16. doi: 10.1016/s0733-8651(05)70232-0. PMID: 11570120.
28. Miura, Si. Exercise prescription in the treatment of hypertension. *Hypertens Res* 46, 521–522 (2023). <https://doi.org/10.1038/s41440-022-01083-z>
29. Pathan FKM, Pandian JS, Shaikh AI, Ahsan M, Nuhmani S, Iqbal A, Alghadir AH. Effect of slow breathing exercise and progressive muscle relaxation technique in the individual with essential hypertension: A randomized controlled trial. *Medicine (Baltimore).* 2023 Nov 24;102(47):e35792. doi: 10.1097/MD.00000000000035792.
30. Papademetriou V, Kokkinos PF. Exercise Training and Blood Pressure Control in Patients With Hypertension. *J Clin Hypertens (Greenwich).* 1999;1(2):95-105.
31. Nieste I, Franssen WMA, Spaas J, Bruckers L, Savelberg HHCM, Eijnde BO. Lifestyle interventions to reduce sedentary behaviour in clinical populations: A systematic review and meta-analysis of different strategies and effects on cardiometabolic health. *Prev Med.* 2021;148:106593. doi: 10.1016/j.ypmed.2021.106593.
32. Rosenberg DE, Zhu W, Greenwood-Hickman MA et al. Sitting Time Reduction and Blood Pressure in Older Adults: A Randomized Clinical Trial. *JAMA Netw Open.* 2024 Mar 4;7(3):e243234. doi: 10.1001/jamanetworkopen.2024.3234.
33. Gibbs B.B, Perera S., Conroy M.B., Jakicic J.M., Muldoon M.F. Effects of sedentary behavior reduction on blood pressure in desk workers: results from the reset-bp randomized clinical trial. *Circulation.* 2025;152, 1, (e5-e6). doi/10.1161/CIRCULATIONAHA.125.074584
34. Kallistratos M, Konstantinidis D, Dimitriadis K, et al. Exercise and cardiac rehabilitation in hypertensive patients with heart failure with preserved ejection fraction: A position statement on behalf of the Working Group of Arterial Hypertension of the Hellenic Society of Cardiology. *Hellenic J Cardiol.* 2024;75:82-92. doi: 10.1016/j.hjc.2023.08.008.
35. Zheng E, Xu J, Xu J. et al. Health-Related Quality of Life and Its Influencing Factors for Elderly Patients With Hypertension: Evidence From Heilongjiang Province, China. *Front Public Health.* 2021;9:654822. doi: 10.3389/fpubh.2021.654822.
36. Sang Ayu Ketut Candrawati; Ni Komang Sukra Andini; Desak Made Ari Dwijayanti. The Effect of Slow Stroke Back Massage on Headache Intensity in Hypertensive Older Adults. *PHJ* 2025, 7, 538-546.
37. Suwaryo PAW, Aminah S, Waladani B, Setianingsih E, Setianingsih R. Physiotherapy Treatment of Hypertension Patients to Reduce Headache Using Slow Stroke Back Massage Therapy Proceedings of the International Conference on Sustainable Innovation on Health Sciences and Nursing (ICOSI-HSN 2022). Atlantis Press. 2022; 176: 182. https://doi.org/10.2991/978-94-6463-070-1_22

Science & Research

38. Safitri Y.E., Susumaningrum LA., Kurdi, F., Basri A.A. Slow Stroke Back Massage Therapy to Reduce Acute Pain in Elderly with Hypertension: A Case Study. *Jurnal Kesehatan Komunitas Indonesia*. 2023; 3(2), 240–252. <https://doi.org/10.58545/jkki.v3i2.54>