Hypertension and comorbidities: A silent threat to global health

Pranali M Wandile, MS, CCRP

1 South Carolina Clinical Research LLC
Orangeburg, SC, USA

*Author for correspondence:
Email: pranali_wandile2006@yahoo.com

Received date: December 07, 2023
Accepted date: February 06, 2024

Abstract

Hypertension is the prominent cause of cardiovascular disease and premature death worldwide. In the past few decades, global mean blood pressure has been somewhat stable and decreased due to the advancement and utilization of antihypertensive medications. According to the Sept. 2023 WHO report, hypertension affects 1 in 3 adults worldwide, and about 4 out of every 5 people with hypertension are not effectively treated. Hypertension characterized by elevated blood pressure is often called the "Silent Killer" and affects millions worldwide. The insidious link between hypertension and other health issues is a concerning matter that deserves our immediate attention. Hypertension often goes unnoticed, as symptoms may be absent or subtle. The condition, if left uncontrolled may result in myriad of severe comorbidities, placing an immense burden on individuals, healthcare systems, and societies at large. This mini review explores hypertension, associated comorbidities, and various treatment strategies.

Keywords: Hypertension, Hypertension and associated comorbidities, Cardiovascular disease, Chronic kidney disease, Stroke, Diabetes mellitus, Obesity, Hypertension management

Introduction

Worldwide, hypertension is a substantial cause of cardiovascular disease and premature death. In the past few decades, global mean blood pressure has been somewhat stable and decreased due to the advancement and utilization of antihypertensive medications [1]. According to the Sept. 2023 WHO report, Hypertension affects 1 in 3 adults worldwide, among which 4 out of every 5 people are not effectively treated. The number of people living with hypertension, blood pressure ≥ 140/90 mmHg, or being treated for hypertension has increased from 650 million to 1.3 billion between 1990 and 2019 [2].

Effective treatment of hypertension could avoid 120 million strokes, 79 million heart attacks, 17 million cases of heart failure, and 76 million deaths for the period of 2023 - 2050. According to a March 2023 WHO report, globally, 1.28 billion adults have hypertension; among them, 42% of adults are diagnosed and treated for hypertension, and 46% of people don't know they have high blood pressure. Globally, around 21% of people with hypertension have their condition under control, and about two-thirds of the global hypertensive patient population live in low- and middle-income countries. Therefore, reducing hypertension prevalence by 33% from 2010 to 2030 is one of the global targets for non-communicable diseases [2].
Figure 1. Adapted from Zhou et al. 2021 [3].

Figure 2. Adapted from American Heart Association, 2022 report [4].
Hypertension characterized by elevated blood pressure is often called the “Silent Killer” and affects millions worldwide. The insidious link between hypertension and other health issues is a concerning matter that deserves our immediate attention. Hypertension often goes unnoticed, as symptoms may be absent or subtle. The condition, if left uncontrolled, may result in a myriad of severe comorbidities, placing an immense burden on individuals, healthcare systems, and societies at large.

Hypertension is also intricately linked with diabetes. The two conditions often coexist, forming a dangerous collaboration. Hypertension can exacerbate the complications of diabetes, such as kidney disease and eye problems, while diabetes can worsen hypertension. This complex interplay underscores the importance of comprehensive management for individuals with both conditions.

Furthermore, hypertension can have a profound impact on mental health. Research showed the association of hypertension with the increased risk for cognitive decline and dementia in the elderly population. The compromised blood flow to the brain can result in memory and thinking problems, emphasizing the need for early intervention and control of hypertension to protect cognitive function. One of the most common and concerning comorbidities associated with hypertension is heart disease [6].

Hypertension and heart disease often go hand in hand, leading to a deadly synergy that claims countless lives each year. Elevated blood pressure can strain the heart, causing hypertrophy and weakening over time. This event increases the possibility of coronary artery disease, coronary artery crisis, and congestive heart failure. Hypertension doesn’t stop at the heart, though. It affects the entire circulatory system, including various important organs such as the brain, kidney, liver etc. Commonly existing comorbid conditions along with hypertension are diabetes, high cholesterol, or pre-existing heart disease. Hypertension can quietly lead to a host of debilitating comorbidities and exacerbate existing health issues due to several interrelated factors [7-9].

1. Increased Stress: Hypertension makes the heart propel the blood against greater resistance, increasing the heart muscle’s thickness, such as left ventricular hypertrophy. This process can gradually weaken the heart, leading to comorbidities such as heart disease.

2. Atherosclerosis: High blood pressure injures the inner lining of blood vessels called endothelium, triggering the body’s protective response, such as depositing cholesterol and other substances at these sites, leading to plaque buildup. Atherosclerosis is a huge contributor to coronary artery disease leading to heart attacks and stroke.

3. Endothelial Dysfunction: Hypertension can cause endothelial dysfunction, leading to inflammation, oxidative stress, and impaired blood vessel relaxation; this process increases the risk of comorbidities like atherosclerosis and heart disease.

4. Stroke Risk: Elevated blood pressure can weaken blood vessels in the brain, increasing the vulnerability towards damage and risk of stroke. Strokes can result in cognitive impairment, physical disabilities, and other comorbidities. Hypertension is, in fact, the leading modifiable risk factor for stroke, emphasizing the urgency of its management.

5. Kidney Damage: Kidneys get impacted due to high blood pressure.
pressure, causing damage to their delicate filtering units, and leading to chronic kidney disease. This, in turn, can escalate to end-stage renal disease requiring prolonged hemodialysis treatment or renal transplant, placing an immense economic strain on healthcare systems.

6. Metabolic Syndrome: Hypertension often coexists with other metabolic abnormalities, such as obesity, elevated blood sugar, and abnormal lipid profiles called metabolic syndrome, which enhance the risk of type 2 diabetes and heart disease.

7. Diabetic Complications: Hypertension and diabetes frequently occur together, and it can worsen the complications associated with diabetes, including diabetic nephropathy, retinopathy, and neuropathy.

8. Eye problems: Hypertension can injure the blood vessels in the eyes, causing vision issues and even vision loss.

9. Peripheral artery disease: Hypertension leads to narrowed leg arteries, causing pain and decreased blood flow.

10. Cognitive Decline and Dementia: High blood pressure has been linked to an enhanced risk of cognitive decline and dementia, especially in older adults. Decreased blood flow to the brain and microvascular damage are potential mechanisms.

11. Obesity: Obesity is a global epidemic in its own right. Excess weight places additional stress on the heart and blood vessels, raising the risk of hypertension. Conversely, hypertension can make it more challenging for people to lose weight, creating a cycle that perpetuates both conditions and further increases the possibilities of obesity-related comorbidities.

12. Inflammation and Oxidative Stress: Hypertension contributes to systemic inflammation and oxidative stress, damaging cells, tissues, and organs throughout the body, increasing the risk of various comorbidities.

13. Lifestyle Factors: Lack of physical activity and unhealthy lifestyle choices, such as poor diet, excessive alcohol consumption, cigarette smoking, drugs etc., often contribute to the development and exacerbation of hypertension. These same factors can also lead to comorbidities like heart disease, obesity, and diabetes.

14. Genetic and Family History: Genetic factors can make individuals more susceptible to hypertension and increase the risk of developing this condition and related comorbidities [8].

Hypertension can have wide-ranging and cascading effects on the body. The cumulative impact of these factors can result in a higher risk of various comorbidities, highlighting the importance of early detection, management, and lifestyle changes to mitigate the associated health risks. Therefore, healthcare systems and individuals must prioritize preventing, detecting, and effectively managing hypertension.

Treatment Approach: The primary goal of hypertension treatment is to lower and maintain blood pressure in a healthy range to reduce the risk of related comorbidities. The following approaches are commonly used [7-9].
**Medicinal Treatment Approach**

1. Regular Monitoring: Patients on antihypertensive medications must monitor their blood pressure regularly to ensure it is well-controlled. Medications may need adjustment over time.

2. Antihypertensive Medications: The primary focus in treating hypertension is to lower blood pressure to a healthy range. Medications may be prescribed based on the severity of hypertension and the presence of comorbidities. Common antihypertensive medications are as follows.
   
   a. Diuretics: They excrete excess sodium and water from the body, thereby reducing blood volume and blood pressure.
   
   b. Beta – Blocker reduces the workload on the heart by reducing heart rate and force of heart contractions.
   
   c. ACE inhibitors (angiotensin-converting Enzyme inhibitors) and ARBs (angiotensin receptor blockers) reduce the strain on the heart by relaxing blood vessels and reducing the resistance in the blood vessels. Calcium Channel Blockers make heart pumping easier by relaxing and widening the blood vessels.
   
   d. In some cases, other medications may be used, such as alpha-blockers, central agonists, or direct vasodilators.

3. Comorbidity-Specific Medications: In cases with specific comorbidities, such as cardiovascular disease, diabetes, or kidney disease, additional medications may be prescribed to manage those conditions. For example, patients with heart disease might be given antplatelet medications or statins, and those with kidney disease may receive medications to protect kidney function.

4. Individualized Treatment: The patient’s specific health profile, including age, ethnicity, and other medical conditions, decides the choice of medication [11-14].

5. Here are some alternative, preventative lines of treatment: Lifestyle changes, as well as medication when needed, can assist in controlling hypertension and thereby decreasing the risk of associated comorbidities.

   a. Lifestyle Modifications: Embrace a heart-healthy diet, for example, “The Dietary Approaches to Stop Hypertension (DASH)”, a Dietary Approach to Stop Hypertension diet is rich in fruits, whole grains, vegetables, and low–fat dairy products while reducing sodium and saturated fat intake [15].

   b. Physical Activity: At least 150 minutes per week of moderate – intensity aerobic activity, brisk walking can help lower blood pressure [16].

   c. Weight Management: Even modest weight loss may result in significant blood pressure reductions, so maintaining a healthy weight is crucial [17].

   d. Meditation and Relaxation Practices: Mindfulness meditation and transcendental meditation have been studied for their potential to reduce blood pressure. Yoga, tai chi, deep breathing, or Biofeedback can help manage stress. It involves learning to control physiological functions, like blood pressure, through relaxation and visualization techniques [18,19].

   e. Limit Alcohol and Sodium: Too much sodium can contribute to hypertension. Reduce alcohol consumption and limit sodium <2,300 mg daily and <1,500mg for certain individuals [7-9].

   f. Herbal Supplements: Garlic: Some studies suggest garlic supplements may significantly affect blood pressure [20]. Hawthorn (Crataegus oxyacantha): This herb is used in traditional medicine for heart conditions and has a blood pressure-lowering effect for hypertension. The previously conducted animal studies results indicated that hawthorn extracts possess a variety of cardiovascular pharmacological properties such as antioxidant, anti-inflammatory, antiplatelet aggregation effect, antihypertensive effect, positive inotropic effect, lipid-lowering, vasodilating effect, endothelial protective effect, efficacious on early stages of congestive heart failure and on hyperlipidemia [21].

   g. *Rauwolfia serpentina* is a natural herbal medicine with a broad spectrum of beneficial medicinal effects. The results of various research studies revealed the hypolipidemic and the hypotensive effect of methanolic extract of this plant in albino rats without causing any adverse effects to the liver and kidney [22]. Hibiscus: Hibiscus tea has been studied for its potential to lower blood pressure, although the effects can vary between individuals [23]. Fish Oil: Omega-3 fatty acids may significantly impact blood pressure by relaxing blood vessels. Research studies showed some evidence of the beneficial effects of fish oil for people with moderate to severe high blood pressure than for those with mild hypertension [24].

   h. Acupuncture: Some people find acupuncture helpful in managing blood pressure, although its effectiveness can vary [25].

   i. Dietary Supplements: A potassium-rich diet can help balance sodium levels and lower blood pressure. Good dietary sources include bananas, sweet potatoes, and spinach. Magnesium supplements may benefit some individuals, especially those with magnesium deficiencies [26].

   j. Chiropractic Care: Chiropractic adjustments may help some people manage hypertension, although more research is needed to establish its effectiveness [27].

Lifelong Commitment: Managing hypertension and its comorbidities often requires a lifelong commitment to medication adherence, lifestyle changes, and regular follow-up with healthcare providers. The treatment of hypertension and its comorbidities is complex, and healthcare providers work closely with patients to develop a comprehensive and individualized treatment plan. The choice of medication and treatment plan should be individualized, considering the patient's age, ethnicity, and any other medical conditions they may have. The goal is to effectively lower and control blood pressure, reduce the risk of comorbidities, and improve overall health. Patient education and engagement are crucial to successful long-term management [28,29]. When managing hypertension and its comorbidities, lifestyle modifications and alternative treatment approaches can complement or, in some cases, substitute conventional medications. It's important to note that alternative treatments should be discussed with a healthcare provider to ensure they are appropriate for the situation. Patients should regularly check blood pressure at home or through medical check-ups. Patients should learn about hypertension and engage in patient education programs or support groups to stay motivated and informed about managing medical conditions. Preventing hypertension-related comorbidities requires a proactive and sustained effort. One can significantly reduce the risk of these serious health complications by making lifestyle changes, adhering to medication when necessary, and maintaining regular contact with the healthcare provider. Taking
hypertension seriously is important, as effective prevention can achieve a better quality of life and a healthier life span.

Declarations
Conflict of interest
The author has no conflict of interest.

Financial support
The author didn’t receive any financial support for this work.

Ethics approval and consent to participate
Nonapplicable.

Consent for publication
Yes.

Availability of data and material
Nonapplicable.

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