

Exploring the association between hypertension and cognitive impairment: Evidence-based insights

To the Editor,

Hypertension, also known as high blood pressure (BP), affects millions of people worldwide. Beyond its well-documented cardiovascular consequences, hypertension has been uncovered an association with cognitive impairment.¹ This is a growing concern, as the number of people with hypertension is expected to increase in the coming years, particularly in developing countries.

Several studies have highlighted a robust association between hypertension and cognitive decline, including a risk of dementia, vascular cognitive impairment and Alzheimer's disease.²⁻⁴ The mechanisms behind this relationship are complex and multifactorial, involving both vascular and nonvascular pathways.² Chronic hypertension leads to structural and functional changes in blood vessels, causing reduced cerebral blood flow, small vessel disease and the development of white matter lesions. These alterations contribute to cognitive impairment, affecting memory, attention and executive functions.³ Emerging evidence suggests that hypertension disrupts brain function through various mechanisms. One key process is the damage inflicted on blood vessels in the brain. The constant high pressure weakens arterial walls, leading to arteriosclerosis, reduced elasticity and the formation of blood clots. These vascular changes directly impact the brain, increasing the risk of ischemic events and reducing the brain's ability to receive adequate oxygen and nutrients.⁴ Moreover, hypertension promotes the accumulation of beta-amyloid plaques and tau tangles, hallmark signs of Alzheimer's disease. It also triggers inflammation, oxidative stress and neurotoxicity, accelerating the progression of cognitive decline. Hypertension-related cognitive impairment often manifests as deficits in attention, processing speed and executive functions. The decline can range from mild cognitive impairment (MCI) to more severe forms, adversely affecting the patient's quality of life.²⁻⁴

Two recent cross-sectional studies shed light on the link between hypertension and cognitive impairment in different populations.^{5,6} In Tanzania, a study conducted

at a tertiary cardiovascular hospital examined the prevalence and correlates of cognitive impairment among hypertensive patients. The results showed that 43.6% of hypertensive participants experienced cognitive impairment.⁵ Another cross-sectional study in China explored the associations between hypertension characteristics and cognitive functions in individuals over the age of 45.⁶ The study revealed an age-dependent correlation, with untreated and treated but uncontrolled hypertension, as well as elevated pulse pressure, showing adverse effects on cognition, particularly in people aged 60 and above.⁶

A systematic review and meta-analysis of 209 prospective studies examined the relationship between BP and cognitive impairment and dementia.⁷ The findings revealed that hypertension was associated with a 1.19- to 1.55-fold increased risk of cognitive disorders. Notably, higher systolic BP in midlife was linked to an elevated risk of cognitive disorders. The use of anti-hypertensive medications was associated with a 21% reduction in dementia risk. The study also identified a U-shaped dose-response curve, indicating that maintaining diastolic BP levels between 90 and 100 mm Hg lowered the risk of Alzheimer's disease.⁷ Another systematic review and meta-analysis focused on the prevalence of MCI in patients with hypertension.⁸ The analysis included 11 studies with a total of 47,179 participants. The pooled prevalence of MCI in hypertensive patients was found to be 30%, indicating a significant prevalence of cognitive impairment in this population. Subgroup analyses revealed variations in prevalence among different regions, study designs, age groups and diagnostic criteria. Notably, Asian samples had a prevalence of 26%, while European samples had a prevalence of 40%.⁸ According to Wei et al.⁶ and Shang et al.,⁹ age plays a critical role as a potential confounding or interacting factor in the relationship between hypertension and cognitive impairment. As age is a well-known risk factor for both hypertension and cognitive decline, adjusting for age in the analysis is essential. The results demonstrate that the association between hypertension and cognitive function varies across

different age groups.^{6,9} This highlights the importance of considering age when studying the impact of hypertension on cognitive impairment, allowing for a more comprehensive understanding of the relationship in different age cohorts.

Effective management of BP is important for maintaining optimal cognitive health. Intensive BP control, antihypertensive medications (angiotensin-converting enzyme inhibitors/angiotensin II receptor blockers/beta-blockers/diuretics), dietary approaches to stop hypertension diet, relaxation techniques (mindfulness meditation/progressive muscle relaxation/deep breathing), cognitive behavioral therapy and maintaining optimal BP levels can play a significant role in improving cognitive health.^{1,4,10}

These findings reinforce the need for comprehensive strategies that integrate hypertension control and cognitive assessment to promote healthy aging and preserve cognitive function. Further, lifestyle interventions could play a crucial role in preventing or delaying cognitive decline in individuals with hypertension.^{10,11} Regular exercise improves blood flow to the brain, reduces inflammation and promotes brain cell growth. A healthy diet, particularly one low in saturated fat and rich in fruits, vegetables and whole grains, reduces the risk of cognitive decline. Stress reduction techniques, cognitive training exercises, sufficient sleep and smoking cessation also contribute to maintaining cognitive function. Implementing these interventions can enhance brain health, reduce chronic stress and mitigate the risk of cognitive impairment in individuals with hypertension.

In conclusion, hypertension has far-reaching implications beyond cardiovascular health. Its association with cognitive impairment necessitates a holistic approach to patient care, encompassing regular cognitive assessments, effective BP control and targeted interventions. By addressing hypertension's impact on cognitive function, we can strive toward improving the overall well-being and quality of life for hypertensive individuals worldwide.

AUTHOR CONTRIBUTIONS

Tarun Kumar Suvvari: Idea; conceptualization; supervision; writing draft and revision of draft; approved final draft.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Not Applicable.

ETHICS STATEMENT

Not Applicable.

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