Environmental determinants of hypertension: Challenges, insights and innovations

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Abstract

Hypertension, a major risk factor for cardiovascular disease (CVD), is increasingly linked to environmental stressors, including air and noise pollution, extreme temperatures, and chemical contaminants. These factors contribute to hypertension by inducing systemic inflammation, oxidative stress, and autonomic nervous system dysregulation. Studies in both humans and animals indicate that fine particulate matter, nitrogen oxides, persistent organic pollutants, and chronic noise exposure impair vascular function, disrupt endothelial homeostasis, and increase cardiovascular strain.

Extreme temperatures further exacerbate these effects. Heatwaves lead to dehydration and electrolyte imbalances, while cold temperatures induce vasoconstriction and heightened sympathetic activation, raising blood pressure levels. In contrast, greenspaces offer protective benefits by improving air quality, reducing noise, promoting physical activity, and alleviating psychological stress. However, unequal access to greenspaces and disproportionate exposure to environmental pollutants place vulnerable populations—such as low-income communities and individuals with pre-existing conditions—at higher risk.

Mitigation strategies involve regulatory policies, technological innovations, and urban planning, alongside individual behavioral adaptations. Efforts include reducing emissions, implementing noise control measures, expanding urban greenery, and promoting climate-resilient infrastructure. Addressing these challenges requires an integrated approach that considers social, economic, and behavioral determinants to assess cumulative environmental stressors comprehensively.

Our presentation highlights the pressing need for interdisciplinary strategies that bridge public health, environmental policy, and clinical interventions. A holistic approach to reducing environmental contributors to hypertension can help mitigate CVD risks and improve global cardiovascular health outcomes.

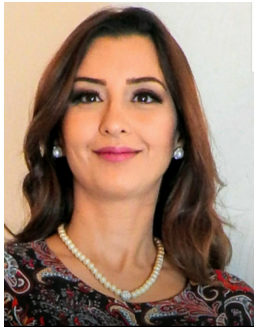
Recent Publications

1- Khraishah H, Alahmad B, Ostergard RL Jr, et al. Climate change and cardiovascular disease: implications for global health. Nat Rev Cardiol. 2022 Dec;19(12):798-812.

2- Peters JL, Grady ST, Laden F, et al. Long-term nighttime aircraft noise exposure and risk of hypertension in a prospective cohort of female nurses. Int J Hyg Environ Health. 2025 Jan;263:114457.

3- Vaduganathan M, Mensah GA, Turco JV, Fuster V, Roth GA. The Global Burden of Cardiovascular Diseases and Risk: A Compass for Future Health. J Am Coll Cardiol. 2022 Dec 20;80(25):2361-2371.

Biography



Intissar HADDIYA, MD, PhD, is a Moroccan nephrologist, and Professor of Nephrology at Mohammed Premier University, Oujda. She graduated from the Faculty of Medicine in Rabat in 2006 and specialized in nephrology, dialysis, and kidney transplantation, with training in France. She holds a PhD in Social Responsibility in Health (2021), a specialization in AI in Healthcare (Stanford University, 2024) and has been President of the Kidney Failure Patients Support Association in Eastern Morocco since 2022. An author and reviewer for several medical journals, she has published over 50 scientific articles and a book on social responsibility in health in Africa (Peter Lang, 2023). She also holds multiple international certifications in nephrology, medical education, and ethics.

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