



Editorial

Air pollution and heart diseases: Are we worried about?

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Received: 26 December 2024

Accepted: 30 December 2024

Published: 31 December 2024

DOI

10.25259/MEDINDIA_29_2024

Quick Response Code:



Pollution is the presence of substances in the environment that have bad effects on the ecosystem as a whole and human health in particular. As per the estimates of the Global Burden of Disease (GBD) study estimates that pollution was responsible for 9 million deaths worldwide in 2019, 61.9% of which were due to cardiovascular (CV) disease, including ischemic heart disease (31.7%) and stroke (27.7%).^[1] The GBD 2019 study attributes 6.67 million global deaths to air pollution, making it the fourth leading risk factor for world mortality. As against popular belief, it is CV deaths (45%) which are more common due to air pollution as opposed to respiratory diseases (8%).

While there is too much noise, awareness, and guidelines available for the control of well-established traditional risk factors for CV disorder (CVD), such as diabetes, hypertension, dyslipidemia, and smoking, air pollution has not received enough attention as a preventable risk factor for CVD, despite the presence of compelling evidence emerging from multiple studies in the last two decades. Air pollution, a harmful mixture of gases and solid particles, endangers human health worldwide. Air pollution includes indoor as well as outdoor pollution. Air pollutants broadly can be classified as primary and secondary pollutants. Primary pollutants are emitted directly into the atmosphere, including particulate matter (PM), carbon monoxide (CO), nitrogen dioxide, and sulfur dioxide (SO₂). Secondary pollutants, formed through interactions with other components, include secondary PM and ozone (O₃). Many pollutants coexist and vary from place to place and at the same place from time to time, so it is challenging to separate their effects on CV health.

PM is a variable mixture of inhaled solid particles and gaseous matter. PM composition tends to vary by weather, emission source time, and location. PM is classified based on aerodynamic diameter: Coarse particles (PM₁₀) with a diameter of 2.6–10 μm, fine particles (PM_{2.5}) with a diameter of 0.1–2.5 μm, and ultrafine particles or PM_{0.1} with a diameter <0.1 μm. PM₁₀ and PM_{2.5} are the most studied PMs relevant to adverse CV health effects, with PM_{2.5} being the most robust evidence to substantiate its role in CV diseases. The deleterious effects of PM on the CV system are primarily mediated through systemic inflammation, endothelial dysfunction, and oxidative stress. PM deposition in the alveoli induces initially localized inflammation and afterward elicits a generalized systemic inflammatory response and results in the activation of procoagulant and prothrombotic pathways, which can lead to an increase in acute cardiac events. PM_{2.5} can also lead to an imbalance of the autonomic nervous system and affect the hypothalamic-pituitary-adrenal axis, further contributing to increased CV events. A meta-analysis of 11 studies published in 2014 showed a 13% increase in acute coronary syndrome events with a 5 mg/m³ increase in the annual mean PM_{2.5} exposure and a 12% increase in acute coronary syndrome events with a 10 mg/m³ increase in the yearly mean PM₁₀.^[2]

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A recent study by Kulick *et al.* found that the hazard ratio for all cerebrovascular events was 2.14 (95% confidence interval [CI]: 1.87–2.44) when comparing the top and bottom quartiles of PM_{2.5}.^[3] Increased PM exposure increases the risk of arrhythmias, especially atrial fibrillation. Both short-term and long-term exposure to PM increases the risk of heart failure, related hospitalizations, and mortality. The PM has robust evidence for its deleterious effect on CV and cerebrovascular events, but other components of air pollution such as O₃, nitrogen oxide, SO₂, and CO also impact CV health and mortality, but the impact is not as established as in the case PM, especially in context of CV events.

Several international societies, such as the American Heart Association, the American College of Cardiology, the European Society of Cardiology, and the World Heart Federation, have jointly issued a statement that calls for urgent action from both the government health regulatory agencies and medical community to work together to reduce the impact of air pollution on global CV health.^[4]

A comprehensive approach is required to reduce the impact of air pollution on CV health.

The first important step in preventing air pollution-related CV disease is to acknowledge the fact by medical practitioners and the government that air pollution is an important contributor to CV diseases, and pollution is a major, potentially preventable risk factor for CV disease. Physicians should always ask for a brief history of pollution exposure in heart patients, especially those with acute cardiac events, and guiding pollution avoidance measures. Air pollution should

gain prominence in medical education, national CV disease prevention programs, and health awareness programs.

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How to cite this article: Singh AK. Air pollution and heart diseases: Are we worried about? *Med India*. 2024;3:43-4.doi:10.25259/MEDINDIA_29_2024