

SMOG AS AN EMERGING CARDIOVASCULAR RISK FACTOR IN PAKISTAN

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Seasonal smog has evolved into a recurring and serious public health challenge in Pakistan, particularly in Lahore and other urban centers of Punjab, where concentrations of fine particulate matter frequently exceed World Health Organization recommended limits by several folds, exposing large populations to hazardous air for prolonged periods each year. While the respiratory consequences of air pollution are well recognized, its cardiovascular implications remain insufficiently emphasized despite robust international evidence identifying air pollution as a major, independent, and modifiable cardiovascular risk factor¹.

Both short-term and long-term exposure to fine particulate matter and associated gaseous pollutants such as nitrogen oxides, sulfur dioxide, ozone, and carbon monoxide have been consistently linked with increased incidence of acute coronary syndromes, heart failure exacerbations, arrhythmias, ischemic and hemorrhagic stroke, venous thromboembolism, and cardiovascular mortality^{2,3}. The biological mechanisms underlying these associations are well established and include systemic inflammation, oxidative stress, endothelial dysfunction, autonomic nervous system imbalance, enhanced platelet activation, and a prothrombotic state, collectively contributing to plaque instability, accelerated atherosclerosis, and adverse cardiovascular events¹.

These effects are particularly pronounced in elderly individuals and patients with pre-existing cardiovascular conditions such as ischemic heart disease, hypertension, diabetes mellitus, chronic kidney disease, and heart failure, making smog a potent trigger for acute cardiovascular decompensation in vulnerable populations². In Pakistan, where cardiovascular disease

occurs at a younger age and remains the leading cause of mortality, smog acts as a powerful risk multiplier that compounds traditional risk factors and likely contributes to seasonal increases in cardiovascular hospital admissions and deaths during winter months³. Despite being among the most affected regions globally, Pakistan lacks robust indigenous data quantifying the cardiovascular impact of air pollution, underscoring an urgent need for locally generated epidemiological research and integration of environmental exposure metrics into cardiovascular studies⁴.

From a clinical perspective, cardiologists and physicians practicing in smog-affected areas must recognize air pollution as a clinically relevant cardiovascular risk factor, incorporate environmental exposure into patient risk assessment, counsel high-risk individuals regarding exposure reduction during peak smog episodes, and ensure optimal implementation of guideline-directed medical therapy during high-risk periods. Beyond the clinical setting, the cardiovascular community has an essential role in advocating for evidence-based public policies focused on emission control, cleaner transportation, sustainable urban planning, and effective air quality monitoring, recognizing that meaningful reductions in cardiovascular morbidity and mortality cannot be achieved through medical interventions alone^{2,4}.

CONCLUSION:

Addressing smog must therefore be viewed not merely as an environmental or respiratory concern, but as a fundamental cardiovascular prevention strategy, and the Journal of Cardiovascular Diseases has a vital role in highlighting this intersection of environmental exposure and cardiovascular health to inform research, clinical practice, and policy in Pakistan.

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