Review highlights the health hazards of air pollution in China

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Globally, air pollution is a major public health hazard. A key air pollutant linked to health risks is ambient fine particulate matter ($PM_{2.5}$), which consists of minute particles, sized less than or equal to 2.5 μm,

suspended in the air.

According to the WHO, annual $PM_{2.5}$ levels should not exceed 5 $\mu g/m^3$. However, the current $PM_{2.5}$ levels in China far exceed this standard and are responsible for approximately 1.4 million $PM_{2.5}$-related excess deaths annually. Even as the country steadily works towards reducing its $PM_{2.5}$ footprint, understanding the latest trends in the epidemiology of $PM_{2.5}$-related diseases, especially cardiopulmonary diseases, is desirable.

Through comprehensive collaborative efforts, researchers from the Chinese Center for Disease Control and Prevention have now summarized the latest epidemiological advances related to the cardiopulmonary effects of $PM_{2.5}$ in the Chinese population. Their review, published in the *Chinese Medical Journal*, focuses on how $PM_{2.5}$ affects the mortality, morbidity, and risk factors for cardiovascular and respiratory diseases.

Explaining the rationale for this review, corresponding author Dr. Xiaoming Shi says, "Compared with other diseases, cardiopulmonary disease is the leading cause of mortality and morbidity associated with $PM_{2.5}$. Over the last decade, most studies have found that $PM_{2.5}$ is associated with morbidity, mortality, and risk factors for cardiopulmonary disease."

For the review, the researchers used data from recent large-scale, multi-center studies from China to account for the effects associated with both short-term and long-term exposure to $PM_{2.5}$.For instance, one time-series study based on mortality data from 130 counties in China revealed that the risk of death from cardiocerebrovascular diseases increases by 0.12% for every 10 $\mu g/m^3$ increase in $PM_{2.5}$ levels.

The review reveals that $PM_{2.5}$ increased the risk of developing cardiovascular disease, including ischemic heart disease, heart failure,

arrhythmia, and ischemic stroke, as well as risk of hospitalization due to cardiovascular causes. Changes in functional index and biomarkers such as heart rate, blood pressure, cholesterol levels, and inflammatory molecules could indicate increased risks.

Similarly, every 10 $\mu g/m^3$ increase in $PM_{2.5}$ concentration was linked to a 1.68% increase in the risk of respiratory mortality. Increases in $PM_{2.5}$ levels were also found to be associated with the hospitalization rate for respiratory diseases and pediatric respiratory outpatient visits. The acute effects of $PM_{2.5}$ were found to be associated with functional outcomes such as peak expiratory flow and the forced expiratory volume or capacity.

The authors use this evidence to propose a list of intervention measures against the effects of ambient $PM_{2.5}$ on cardiopulmonary health. They suggest government interventions to improve industrial emission standards, upgrade industrial boilers, adopt cutting-edge industrial technology to reduce emissions, and promote clean fuels for residential use.

Together, these efforts could reduce both $PM_{2.5}$ pollution and its health burdens, in line with China's 14th Five-Year Plan and sustainable development goals. On the personal front, use of air purifiers and masks can protect people from the hazards of $PM_{2.5}$, especially if they live in areas with high $PM_{2.5}$ levels.

Elaborating on the prospects, Dr. Shi says, "The Chinese government has formulated carbon neutrality goals to reach a peak as soon as possible (before 2030), achieve rapid emission reduction by 2030 to 2050, and net-zero emissions by 2050 to 2060. Clean air action depends on effective supervision, inter-departmental cooperation to promote supervisory work, and the strict implementation of actions and requirements."

In short, by documenting the latest epidemiological evidence, this review can serve as a key guide for identifying targets of $PM_{2.5}$ reduction and health improvement in China. It also underscores the need for additional research in several areas, including the identification of highly sensitive biomarkers and pathogenic effects of $PM_{2.5}$ constituents on health.

More information: Tiantian Li et al, Ambient fine particulate matter and cardiopulmonary health risks in China, *Chinese Medical Journal* (2023). DOI: 10.1097/CM9.0000000000002218

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