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Air Pollution, a Case of Neglect in Cardiovascular Disease

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Letter to Editor

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Dear Editor

Various studies indicate that air pollution poses an environmental threat to public health, particularly cardiovascular disease (CVD) [1, 2]. While the impact of air pollution on an individual scale is relatively low compared to other significant risk factors for cardiovascular diseases, the large number of people affected can result in a substantial increase in the total mortality of the population. Consequently, the effect of air pollution on cardiovascular disease is regarded as a serious issue in public health [3]. Air pollutants comprise gases, liquids, and particulate matter (PM), with PM playing a significant role in cardiovascular mortality [3]. Some cardiovascular diseases associated with the inhalation of air pollutants include heart failure, acute myocardial infarction, atherosclerosis, cardiac arrhythmias, and cardiac arrest [4]. It can also induce changes in blood pressure, heart rate, blood coagulability, and vascular tone [2].

Air pollution accounts for a large portion of the global disease burden, with nearly 12% of all mortality in 2019 attributable to both household and outdoor air pollution. Approximately half of these statistics (6.7 million deaths) were attributed to CVD. In total, air pollution was responsible for almost 20% of CVD deaths. In 2019, air pollution was ranked as the 4th leading cause of death, accounting for more mortality than high LDL cholesterol, high BMI, physical inactivity, or alcohol consumption [5]. Studies have demonstrated an association between heart failure hospitalization or death and an increase in carbon monoxide, nitrogen dioxide, and sulphur dioxide concentrations. There is also an association between the increase in particulate matter concentration and heart failure hospitalization or death, with the strongest association observed on the first day of exposure [6].

Estimations suggest that a mean decrease of 3.9 μg/m3 in PM2.5 (PM <2.5 μm in diameter) could prevent 7978 heart failure hospitalizations per year. Even smaller decreases in PM2.5 could still prevent hospitalizations, albeit to a lesser extent, and could still confer significant public health benefits [6]. Numerous studies globally have demonstrated a consistent relationship between short-term increases in PM and a rise in daily cardiovascular mortality and morbidity. These studies have also indicated that long-term PM exposure can lead to adverse cardiovascular outcomes [3]. Time-series studies suggest that if the mean 24 hour PM2.5 concentration increases by 10 μg/m3, the daily cardiovascular mortality relative risk will increase by about 0.4% to 0.1% [7].

According to multiple studies, PM induces

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CVD through oxidative and inflammatory processes, and it also impacts heart rate and blood pressure by disrupting the autonomic nervous system [8, 9]. The expression of CVD-related genes could be altered as a result of epigenetic changes due to inhalation of air pollutants. These changes in gene expression can lead to cardiac hypertrophy, atherosclerosis, and an increase in systemic inflammation [8].

Over the past decades in the United States, it has been demonstrated that US life expectancy has increased by up to 15% by reducing PM concentration through regulatory actions and technologies [5]. Numerous studies indicate that reducing individual exposure to PM could enhance cardiovascular health in patients with cardiovascular disease [5, 10, 11]. Room air filtration could be employed as a method for individuals at risk [5]. Wearing a face mask is also presumed to be potentially protective against urban airborne PM, as it is strongly associated with a decrease in blood pressure and myocardial ischemia and an improvement in heart rate variability [10, 11]. One of the significant issues is that clinicians and healthcare workers often overlook air pollution as a modifiable factor. As a solution, they could be educated and reminded to make patients aware of the benefits of reducing exposure to air pollutants on cardiovascular health. Air quality indices could be beneficial to cardiovascular patients by displaying short-term changes in air quality. Thus, they can conduct most of their activities when the air quality is better [5]. Strategies for mitigating air pollutants are most effective in urban areas, which involve advancing vehicle technology (most notably particle filters), improving public transportation, and implementing air quality control plans [12]. Another approach is to alter the modes of electricity generation to reduce PM emissions, with the benefits being largest in developing countries [13].

Conclusion

In conclusion, it is imperative to enhance understanding about air pollution in order to devise effective therapeutic strategies and to reduce pollutant emissions in the air by formulating government environmental policies to mitigate their health implications.

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