Environmental Pollution and Cardiovascular Diseases: Identify and Prevent!

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"Education is the most powerful weapon which you can use to change the world."
Nelson Mandela

Exposure to environmental pollution is a key factor in the development and worsening of cardiovascular diseases. This alert was issued in a 2004 statement from the American Heart Association (AHA).¹ A large body of new scientific evidence has been accumulated since then, allowing for a better understanding of the aspects related to this modifiable risk factor for cardiovascular diseases.

Cardiovascular diseases (CVD) are the major cause of death worldwide, accounting for more than 17 million premature deaths in 2016. Out of these deaths, 3.3 million are attributable to air pollution, 2.1 million of which are due to ischemic heart disease (IHD) and 1.1 million due to stroke.² Air pollution accounts for 19% of all cardiovascular deaths, and those 3.3 million deaths linked to air pollution exceed the deaths caused by smoking (2.48 million), obesity (2.85 million) and elevated blood glucose levels (2.84 million). Hypertension is the only risk factor that compared to pollution contributes to a greater burden of cardiovascular mortality.³

Exposure to chronic pollution causes an increase in oxidative stress and a consequent inflammatory state, which accelerates atherosclerosis through vasoconstriction, increased heart rate, increased blood pressure, endothelial dysfunction, increased platelet aggregation, dyslipidemia and insulin resistance.³ Figure 1 illustrates some of the mechanisms proposed for the pathophysiology of the effects of pollution on the cardiovascular system. However, it is not only chronic exposure to air pollutants that is dangerous, since short-term exposure to polluted air can be extremely harmful for cardiovascular health, with an increased risk of myocardial infarction and stroke.⁴ One of the major studies was carried out in China and showed that a 10 µg/m³ increase within a 2-day period in concentration of inhalable particles with aerodynamic diameters less than 10 microm (PM10) is associated with a 0.35% and 0.44% increase in total mortality and cardiovascular mortality, respectively.⁵ Among the populations particularly susceptible to the effects of pollution are women, the elderly and lower-income individuals, obese individuals, diabetic individuals and those with traditional cardiovascular risk factors, such as hypertensive and dyslipidemic individuals.⁶ International cardiology societies have published reports recommending that cardiologists assume an active position in raising awareness of the risks for heart disease posed by pollution.⁶,⁷ The active involvement of the cardiology community in public policy formulations aiming at the control of air pollution levels is essential. Individuals with heart disease who practice physical exercise for the sake of improving their cardiovascular health may not see its full benefit when exposed to traffic pollution, since it can prevent the beneficial cardiopulmonary effects of walking in people with ischaemic heart disease, and those free from chronic cardiopulmonary diseases.⁸ Thus, it is essential that cardiologists begin to focus their attention on environmental pollution, identifying the more susceptible individuals and proposing changes in their lifestyle, which may mitigate the deleterious effects of this new risk factor. Hadley et al.,³ proposed a series of actions with the purpose of developing a clinical approach to mitigate the effects of pollution on the cardiovascular system (Table 1).

Keywords
Cardiovascular Diseases / mortality; Cardiovascular Diseases / prevention & control; Environmental Pollution; Air Pollution; Risk Factors; Oxidative Stress.
In 2016, 95% of the world’s population lived in areas where ambient PM2.5 levels exceeded 10 μg/m³ (annual average), which is the maximum tolerated limit established by the World Health Organization. Global population-weighted PM2.5 concentrations are 18% higher compared to the 2010 levels, which means that the world’s population is progressively more exposed to pollution. This trend must be reverted so that we can have a healthier planet and healthier hearts. It is the responsibility of health-care professionals to disseminate ways to achieve the sustainable development goals of the United Nations Organization. With regard to
environmental pollution, educating society, healthcare professionals and patients is essential to mitigate the harmful effect of this new prevalent cardiovascular risk factor.

References


