

Editorial

The Link Between Air Pollution and Cardiovascular Diseases

Air pollution constitutes a major global environmental health problem and has been reported to cause approximately 2 million premature deaths worldwide every year¹. Both indoor and outdoor pollutants pose serious danger to health. The *WHO Air quality guidelines* prescribe limits for the concentration of selected air pollutants: particulate matter (PM), ozone (O₃), nitrogen dioxide (NO₂) and sulphur dioxide (SO₂), applicable across all WHO regions. It also specifically recommends that a reduction in particulate matter (PM₁₀) pollution from 70 to 20 micrograms per cubic metre can significantly reduce air quality-related deaths by around 15%.

In developing countries, the major sources of air pollution include the use of wood, coal and crop residues for domestic energy, and the average annual levels of PM₁₀ exceeds 70 micrograms per cubic metre. The global problem of air pollution is compounded by the observation that although the proportion of global energy derived from biomass fuels fell

from 50% in 1900 to around 13% in 2000, there is evidence that their use in developing countries is ever-increasing².

The literature contains an increasing number of reports on the relationship between air pollution and the incidence of cardiovascular diseases^{3,4}. A recent report by Song links air pollution to heart diseases and stroke; it also reveals that 'about 6,000 Canadians die from short-term exposure to air pollution, 69% of

which are from cardio- and cerebrovascular diseases affecting an artery within the brain or blood supply to the brain³. Both short- and long-term exposure to PM have been shown to contribute to increased risk of ischaemic heart disease, atherosclerosis⁵ and myocardial infarction⁶. The Committee on the Medical Effects of Air Pollutants (COMEAP) set up by the Department of Health, UK, to advise on the possible effects of outdoor air pollutants on cardiovascular disease in the UK reviewed scientific evidence for the association between air pollution and cardiovascular diseases, based on several laboratory animal and epidemiological studies³. While their report did not conclusively identify which components of the ambient pollution mixture are responsible for the effects of air pollutants, an important role for fine particles was suggested.

Two main mechanisms underlying the cardiovascular effects of air pollutants have been proposed: the clotting hypothesis and the neural hypothesis³: the clotting hypothesis suggests that inhaled small particles may trigger an inflammatory response, resulting in the production and release of various chemical mediators which in turn may activate the clotting process and hence an increased tendency for clot formation. Also, the various chemical mediators resulting from inflammation may induce rupture of atherosclerotic plaques and thus the likelihood of thrombogenesis in a coronary blood vessel, resulting in acute myocardial infarction. The neural hypothesis suggests that air pollutants stimulate neural receptors in the lungs which

may in turn have reflex effect on the rhythm of the heart. A common link between both hypotheses is inflammatory stimuli which result in increased coagulation and reduced fibrinolysis⁷.

While cardiovascular diseases are known to be related to outdoor air pollution as well as active and passive smoking in developed countries, there is a paucity of information about similar studies in developing-countries (particularly in sub-Saharan Africa), where air pollution from household solid fuel usage constitutes a major hazard. Thus, very little information is available to quantify the relationships between air pollutants and cardiovascular diseases. Extrapolating the results of air pollution studies in developed countries to situation in developing countries is fraught with difficulties⁸.

Intervention strategies, particularly, in developing countries, should be geared towards reducing the level of indoor pollutants and should be affordable and sustainable, while taking cognisance of domestic energy requirements, safety, cultural needs and environmental protection. The use of cleaner fuels is recommended but this may be beyond the reach of poor communities. National policies, targeted at fuel pricing incentives are necessary to increase access by the poor to cleaner fuels. Finally, there is a dire need, in developing countries, to alleviate poverty as well as dependence on polluting fuels in order to limit the cardiovascular risks associated with air pollution.

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