

## Menace of Air Pollution in 21<sup>st</sup> Century

Pollution is an undesirable change in the physical, chemical or biological characteristic of air, water and soil which may affect life or create potential hazards for any living organism. Rapid technological advances and industrialisation process done by humans are major factors not only for polluted air but land and water resources too. Globalisation is another major factor responsible for degradation of our environment. Pollution today poses a great threat to the survival of the world we live in. Our air is filled with highly toxic gases, released by power industries, burning of fossil fuels, vehicular emissions, etc. The increase in the pollution level over the years has caused severe damage to the earth's ecosystem, thereby affecting quality of life of humans at large, especially children and aged peoples.

Early in the 20th century, dramatic episodes of outdoor air pollution in developed countries showed that air pollution could cause excess deaths and that children might be at increased risk during the times of high levels of pollution.<sup>1</sup> During the past two decades, the potential risk to children's health due to exposure to air pollutants in indoor environments has also been recognised.<sup>2-6</sup> The first report in the biomedical literature to describe an association between indoor cooking smoke and childhood pneumonia in developing countries was done at Lagos University Teaching Hospital.<sup>1,7</sup>

The US Surgeon General asserted in a report on smoking and health that tobacco smoke can be a significant source of atmospheric pollution in enclosed areas. In the presence of cigarette smoke, many normal non-smokers experience eye and throat irritation, headache, rhinitis, and coughing; allergic people report wheezing, sneezing, and nausea. International development and public health organizations have sought to implement preventive measures to reduce this exposure, such as the design and dissemination of improved stoves and fuels. Health impacts of outdoor (ambient) particulate matter in urban areas of industrialised countries have been identified and quantified in epidemiological and physiological studies in the past two decades.

As per World Health Organization (WHO) report of 2012, globally 4.3 million deaths were attributable to indoor air pollution.<sup>8</sup> Approximately three billion people used solid fuels (i.e., wood, charcoal, coal, dung, crop wastes) on open fires or traditional stoves for cooking and heating their homes.<sup>8</sup> Exposure to indoor air pollution, especially to particulate matter from the combustion of biofuels has been implicated as a causal agent for respiratory diseases in the developing

countries.<sup>9</sup> Much of the cooking is carried out in indoor environment with poor ventilation and lack of exhaust, primarily affecting the women and children. Smoke results from incomplete combustion of solid fuel in a closed environment.<sup>8</sup> Household air pollution is prevalent mainly in rural areas while ambient air pollution is predominantly an urban problem. In poorly ventilated dwellings, smoke in and around the household may exceed acceptable levels for fine particles by even 100-folds.

Air pollutants in urban areas having several sources, such as combustion of fossil fuels, power plants, automobile exhaust, incinerators, industrial processes, and natural sources such as sea spray, volcanic eruption, pollen grains and particles of soil. Indoor air pollutants concentrations that depend on both (indoor and outdoor) sources are also responsible for damaging human respiratory system because urban people typically spend more than 90% of their time indoors. The main sources of indoor air pollutants include cooking fuel smoke, environmental tobacco smoke, building materials and furnishings, cleaning agents, biological agents, dusting and vacuuming, and by transport from outdoors via leakage through the walls, windows, or the ventilation system. Women and children are the most vulnerable as they spend more time indoors and exposed to smoke. An appraisal of indoor air quality is the most important aspect in the understanding of the impact of urban air pollution on human health. The major air pollutants includes respirable particles, sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide, carbon dioxide, ozone, volatile organic compounds are especially harmful to people with lung diseases such as asthma, bronchitis, rhinitis, chronic obstructive pulmonary disease, cough, shortness of breath, wheezing, and lung cancer, skin cancer, irritation of eyes. Particulate matter is associated with more frequent respiratory illness because airborne particulates easily reach the deepest recesses of lungs and damage. Particulate matter is also responsible for possible global climate change and global warming through direct and indirect effects on earth's radiation balance.

In general, we noted a widespread general assumption that the indoor environment is "better" or "more livable" (i.e., cleaner, more comfortable, healthier) than the outdoor environment; to many, it seems obvious that a building provides shelter from harmful substances in the ambient environment. Throughout the world, various air quality indication systems, which are designed for outdoor use, give

warnings to stay indoors during episodes of poor air quality.<sup>10</sup>

Inhalation of polluted air is extremely bad for humans, as it directly affects the lungs. Inhaling poisonous air is as hazardous as smoking. Smoke or dust are major contributions in polluting the air we breathe. Air pollution, a cause of concern all over the world, is increasing day by day, causing respiratory diseases, such as, asthma, COPD, bronchitis, etc. Current levels of air pollution are responsible for number of premature deaths every year as well as allergies, respiratory and cardiovascular diseases, that result in extra medication, hospitalisation and a great loss of working days. This causes an enormous economic burden on our population and indirectly on the governments. Besides acute diseases, chronic respiratory diseases are also causally linked to exposure to indoor air pollution in developing countries and are a leading cause of global burden of disease.<sup>11</sup>

Over the past two decades, there has been a rapid increase in urbanisation and industrialisation in India. With this has come a dramatic increase in the number of residences, office buildings, and manufacturing facilities, together with an increase in both the number and density of motor vehicles. In recent years, levels of SO<sub>2</sub>, suspended particulate matter (SPM), and NO<sub>2</sub> in metropolitan cities of India have increased. The major sources of indoor and outdoor SO<sub>2</sub>, SPM, and NO<sub>2</sub> in Delhi, the national capital of India, include industrial waste, vehicular traffic, the Indraprastha power plants, railway shunting yards, burning of fossil fuels and fires, domestic coal burning, cooking, and tobacco smoke.<sup>5,12</sup> Coal is still used for domestic cooking in some parts of Delhi, usually by people in lower income groups. Emission from these sources has immediate implications for the indoor environment, because the air in both naturally and mechanically ventilated buildings is replenished to varying degrees with ambient air, which may or may not be filtered or otherwise conditioned before being brought indoors. In several studies, researchers have demonstrated that the ambient air can have a significant impact on the indoor environment.<sup>13,14</sup>

The earlier reported epidemic due to air pollution was in 1930 in Belgium (Meuse River). In India, the worst disaster was occurred in 1984 at Bhopal in the state of Madhya Pradesh, Killing thousands of people (Bhopal gas tragedy).

However, a fundamental question usually remains unasked: Is indoor air really clean?

First, it must be recognised that indoor air is simply an extension of ambient air. Air penetrates indoors

through doors, windows, air conditioners, and other possible routes.

Pollution can be controlled, if not eliminated. Every one has to make efforts for greener environment by planting more trees, proper disposal of waste, etc.

**Raj Kumar**

*Editor-in-Chief  
and*

*Director (Acting)*

*Vallabhbhai Patel Chest Institute*

*University of Delhi, Delhi – 110 007*

*E-mail: rajkumaropci@gmail.com*

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