
AIR POLLUTION'S EFFECTS ON THE ENVIRONMENT AND HUMAN HEALTH

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ABSTRACT

Air pollution is a serious issue in the modern world, with serious toxicological consequences for health and the environment. Although there are a variety of emission sources, automobiles and industrial processes account for the majority of air pollution. Particle pollution, ground-level ozone, carbon monoxide, Sulphur oxides, nitrogen oxides, and lead are six major air pollutants, according to the World Health Organization. Long and short-term exposure to air-borne toxicants has a variety of toxicological effects on humans, including respiratory and cardiovascular diseases, neuropsychiatric complications, eye irritation, skin diseases, and long-term chronic diseases like cancer. Several studies have found a direct link between poor air quality and an increase in morbidity and mortality, primarily due to cardiovascular and respiratory diseases. Air pollution is a major environmental risk factor for diseases like asthma, lung cancer, ventricular hypertrophy, Alzheimer's and Parkinson's diseases, psychological complications, autism, retinopathy, foetal growth, and low birth weight, among others. We aimed to discuss the toxicology of major air pollutants, their sources of emission, and their impact on human health in this review article. We've also proposed some practical ways for Iran to reduce air pollution.[1], [2].

KEYWORDS: *Air Pollution, Cardiovascular Diseases, the Environment, Human Health, and Respiratory Tract Diseases Etc.*

1. INTRODUCTION

Exposure to high levels of air pollution can cause a variety of adverse health outcomes. It increases the risk of respiratory infections, heart disease and lung cancer. Both short and long term exposure to air pollutants have been associated with health impacts. More severe impacts affect people who are already ill. Children, the elderly and poor people are more susceptible. The most health-harmful pollutants – closely associated with excessive premature mortality – are fine PM2.5 particles that penetrate deep into lung passageways.

Fighting air pollution is everybody's responsibility. We all need to do more, a lot more. Swiftly and proactively to reduce air pollution. Concerted and coordinated efforts with active involvement of all the sectors is imperative. This includes the Government (national, state and local governments), cities, community at large and individuals. To national governments: reduce emissions and set national standards that meet WHO air quality guidelines. Invest in research and education around clean air and pollution – they are an essential tool.

- To cities and local communities: Public policies across sectors must factor in public health from the beginning, followed up with sufficient data and tools to assess them.
- To individuals: Continue to stand up for your right to healthy and sustainable environments. Hold your governments accountable.
- All of us – in government, business, and individual – we are all accountable. Think and rethink, about the way you live and consume and make sustainable choices for yourself, your children and your children’s children.

Particulate matter is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Large concentrations of particulate matter are typically emitted by sources such as diesel vehicles and coal-fired power plants. Particles less than 10 micrometers in diameter (PM10) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter (PM2.5) are referred to as "fine" particles and pose the greatest health risks. Because of their small size (approximately 1/30th the average width of a human hair), fine particles can lodge deeply into the lungs.

Major sources of ambient air pollution include inefficient modes of transport (polluting fuels and vehicles), inefficient combustion of household fuels for cooking, lighting and heating, coal-fired power plants, agriculture, and waste burning. Interventions to reduce air pollution include developing sustainable transport in cities; implementing solid waste management; providing access to clean household fuels and cookstoves; developing market for renewables energies and energy efficiency, and implementing industrial emissions reductions.

WHO's main function is to identify and monitor those air pollutants with the greatest impact on people's health. This helps the WHO Member States to focus their actions on the most effective way to prevent, or reduce health risks. WHO's task is to review and analyze the accumulated scientific evidence, and use expert advice to draw conclusions on how much different air pollutants affect health as well as identify effective measures to reduce the air pollution burden.

WHO Member States adopted in 2015 a resolution to “address the adverse health effects of air pollution”. The following year, Member States agreed on a road map for “an enhanced global response to the adverse health effects of air pollution”. WHO is working on four pillars?

- Expanding the knowledge base
- Monitoring and reporting
- Global leadership and coordination
- Institutional capacity strengthening,

Pollution is defined as the introduction of chemicals that are detrimental to people and other living organisms into the environment. Pollutants are hazardous solids, liquids, or gases that are generated in higher-than-normal quantities and degrade our environment's quality.[3]

1. Causes of Air Pollution

Air pollution is a significant issue of past few decades that has a severe toxicological effect on health and the environment. The causes of pollution range from tiny unit of smokes and natural sources such as volcanic activity to huge volume of emission from motor engines of vehicles and industrial activities. Long-term impacts of air pollution on the development of illnesses such as respiratory infections and inflammatory diseases, cardiovascular dysfunctions, and cancer is well accepted Therefore, air pollution is associated with millions of mortalities worldwide each year.

New research has shown the connection between male infertility and air pollution.

Air pollution has now arisen in developing nations as a consequence of industrial operations and also increase the amount of emission sources such as unsuitable automobiles. About 4.3 million people die from home air pollution and 3.7 million from ambient air pollution, most of whom reside in Asia. In Iran, as a developing nation, the level of air pollutants has risen steadily since the commencement of industrialization in the 1970s, but it has reached a highly hazardous level in certain megacities such as Tehran, Mashhad, Tabriz, Isfahan, Ahvaz, Arak, and Karaj during the last two decades. Iran is the world's third major polluted nation in the globe, which results in 16 billion \$ yearly loss. In fact, four of the top 10 air-polluted cities are in Iran. Ahvaz is the most air polluted city in the world with microdots blowing in from neighboring nations, with particle levels three times those of Beijing, and almost 13 times that of London.

Air pollution caused approximately 4460 fatalities in 2013 alone in Tehran but the truth appeared greater and is growing worse every year. Therefore, it is of significant significance to explain the issue, especially its harmful effects on human health and offer suggestions as a foundation for environmental guidelines and standard procedures in the area of air pollution in Iran. The current paper is neither a systematic review nor a descriptive, educational research. It is a topic-based descriptive review in which the writers attempt to describe an issue which is the main health and ecological concern in developing nations like Iran.

In this study, we have attempted to outline the toxicity of air pollution and associated illnesses with a potential mechanism of action and suitable treatment of the patients. Therefore, it should be helpful for the environmental and health experts especially policy makers, emergency doctors, and other clinicians who may be engaged in air pollution and associated illnesses. In this article, we also examine causes of air pollution and suggested some viable remedies which may be helpful for the environmental lawmakers and decision makers.[4]

Effect of Air Pollution on Health

Ground-level ozone and Particulate Matter are the most prevalent air contaminants (PM). There are two kinds of pollution in the air: The term "outdoor pollution" refers to pollution that occurs in the open air. The pollution caused by the burning of fuels in the home is known as indoor pollution. People who are exposed to excessive levels of air pollution develop illness symptoms and states of varying severity. These health consequences are divided into two categories: short-term and long-term. Old people, children, and individuals with diabetes who have a predisposing heart or lung condition, particularly asthma, are vulnerable groups that need to be aware of healthcare protective measures.

As previously mentioned, the relative magnitudes of the short- and long-term impacts have not been fully explained owing to various epidemiological methods and exposure mistakes, according to new epidemiological research from Harvard School of Public Health. New models are suggested for more effectively evaluating short term and long human exposure data. As a result, in this part, we discuss the most frequent short and long-term health consequences, as well as general concerns about both kinds of impacts, since they are typically reliant on environmental factors, dosage, and individual sensitivity. Short-term side effects include irritation of the eyes, nose, skin, and throat, wheezing, coughing, chest tightness, and breathing difficulties, as well as more severe conditions including asthma, pneumonia, bronchitis, and lung and heart issues.

Air pollution may also induce headaches, nausea, and dizziness in those who are exposed to it for a short period of time. Long-term exposure to pollutants may exacerbate these issues by harming the neurological, reproductive, and respiratory systems, as well as causing cancer and, in rare cases, death. The long-term consequences are chronic, spanning years or even a lifetime, and may

even result in death. Furthermore, the long-term toxicity of many air contaminants may cause a variety of malignancies. As previously mentioned, respiratory diseases are strongly linked to air pollution intake. These contaminants will enter the body via the airways and build up in the cells. The pollutant component involved, as well as its source and dosage, should be linked to damage to target cells. Country, region, season, and time all have an impact on one's health. In connection to the aforementioned variables, prolonged exposure to the pollutant should predispose to long-term health consequences.

Particulate Matter (PMs), dust, benzene, and O₃ are all known to cause severe respiratory problems. Furthermore, if you already have a respiratory condition like asthma, you're at a higher risk. People with a predisposed illness condition are more likely to have long-term consequences. When contaminants pollute the trachea, voice changes may occur after a short period of time. Air pollution may cause chronic obstructive pulmonary disease (COPD), which increases morbidity and death. COPD risk is mostly influenced by long-term impacts from traffic, industrial air pollution, and fuel combustion. After being exposed to air pollution, a variety of cardiovascular consequences has been documented.

Changes in blood cells as a result of long-term exposure may have an impact on heart function. Long-term exposure to traffic emissions has been linked to coronary arteriosclerosis, while short-term exposure has been linked to hypertension, stroke, myocardial infarcts, and heart failure. Long-term exposure to nitrogen oxide (NO₂) has been linked to ventricular hypertrophy in humans. Long-term exposure to air pollution has been linked to neurological consequences in both adults and children. Long-term air pollution seems to be linked to psychological problems, autism, retinopathy, prenatal development, and low birth weight. The etiologic agent of neurodegenerative illnesses (Alzheimer's and Parkinson's) is unknown, but prolonged exposure to air pollution is thought to be a role. Pesticides and metals, as well as nutrition, are mentioned as etiological variables. Oxidative stress, protein aggregation, inflammation, and mitochondrial dysfunction in neurons are all processes in the development of neurodegenerative disease.[5], [6]

2. DISCUSSION

Air pollution impacts are based on exposure to air pollution. For urban air pollution, the population at risk is the urban population, except for crop damages which are estimated on a total population basis. For indoor air pollution, the population at risk is calculated at the total population level. Air pollution has a negative impact on our lives in a variety of ways. Air pollution causes diseases such as chronic, asthma, pulmonary insufficiency, cardiovascular diseases, and cardiovascular mortality. Air pollution-related diseases have a significant economic impact as well as a societal impact. High amounts of air pollution can have a range of negative health consequences such as respiratory infections, heart problems, and lung cancer are all increased by the air pollution. Short and long-term exposure to air pollution has been linked to negative health effects.[5], [7][8], [9]

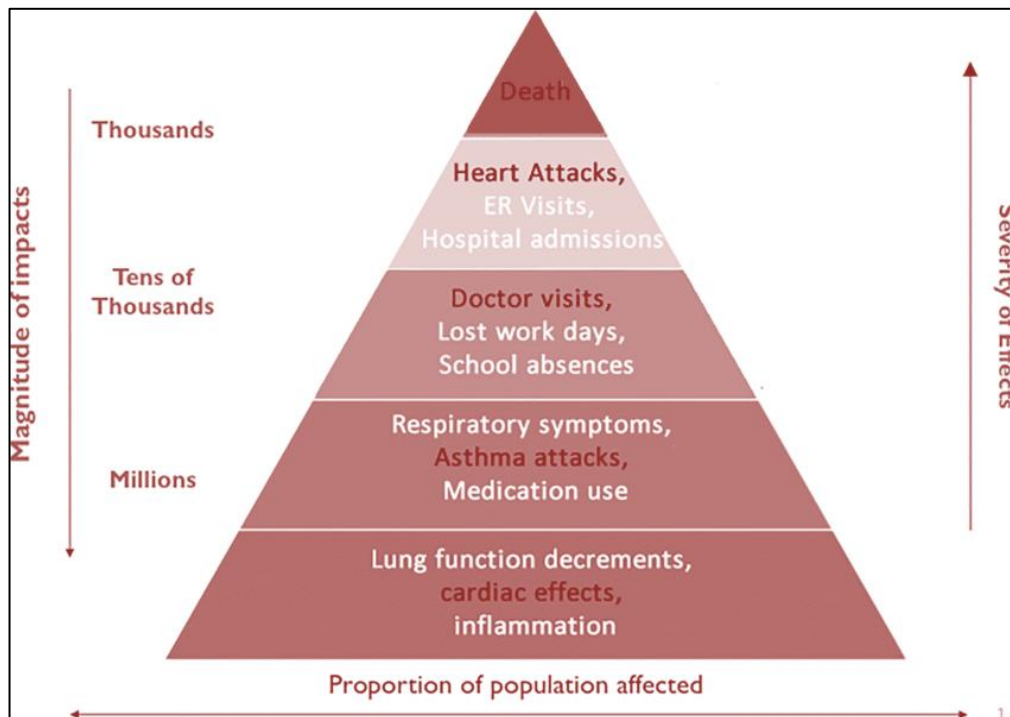


Figure 1: Proportions of the Population Affected By the Severity of the Cause.

3. CONCLUSION

Air pollution has a significant impact on human health, activating and inducing a wide range of diseases that result in high morbidity and mortality rates, particularly in developing nations like Iran. Air pollution is a risk factor for both chronic and acute diseases. As a result, air pollution control is critical and should be at the top of the government's priorities list. All rules and regulations relating to air contamination must be updated by policymakers and legislators in these countries. A powerful environmental protection agency must lead the coordination between several departments involved in air pollution. Budgets for administration, research, development, monitoring, and full control should all be sufficient for an efficient environmental protection organization. The Indian government has already taken a number of steps to reduce and manage air pollution in the country. Furthermore, the government must establish legislation to prevent this growing air pollution and pollutant emission standards.[6][10], [11].

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