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Air Pollution and Its Destructive Impact on Human Health

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ABSTRACT
Air pollution is a huge problem in the modern, industrialized world because of the devastating toxicological effects it has on people and the planet. Air pollution comes from a variety of sources, the most significant of which being motor vehicles and industrial processes. Particle pollution, ground-level ozone, carbon monoxide, sulphur oxides, nitrogen oxides, and lead are the six primary air pollutants listed by the World Health Organization. Different toxicological effects, including as respiratory and cardiovascular disorders, eye irritation, skin diseases, and long-term chronic diseases like cancer, are seen in humans after short and long-term exposure to air dispersed toxicants
The purpose of this literature review was to examine the key contributors to air pollution and the effects that this pollution has on human health.
KEYWORDS: *Air pollution, environment, human health, respiratory tract diseases*

I. INTRODUCTION

Pollutants in the air can be harmful to living things of all kinds, including humans, animals, and plants. It's bad for structures, too. There is a wide variety of air pollutants. Particles can take the form of gases, solids, or even liquid droplets.

The issue of air pollution has gained significant attention in recent decades due to its extensive toxicological implications for both human health and the environment. The emission volume originating from motor engines in automobiles and industrial operations surpasses that of smaller units of cigarettes and natural sources such as volcanic activities. It is widely acknowledged that air pollution has enduring effects on the progression of illnesses such as respiratory infections and inflammations, cardiovascular dysfunctions, and cancer, resulting in millions of fatalities worldwide each year. A recent study has established a correlation between air pollution and male infertility.

Air pollution encompasses all adverse effects that arise from actions that contaminate the air and/or cause harm to the ecosystem, as per its definition. Air pollution is caused by both anthropogenic activities and natural phenomena. This mixture comprises a diverse range of contaminants in solid, liquid, and gaseous states. The topic of indoor air pollution will not be expounded upon in great detail within this context.

The Pollutant Standard Index (PSI) is frequently utilised in risk assessments as a quantitative measure and indicator of pollutants. The variable in question is an integer that ranges inclusively from 0 to 500. In 1974, Thom and Ott introduced the PSI as a standardised reporting system for air quality.Consequently, it would facilitate a comparison of the relative hazardousness of each individual pollutant. The calculation of the Pollutant Standards Index (PSI) involves the consideration of five primary air pollutants, namely particulate matter (PM), sulphur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), and ozone (O3).

According to Johnson and colleagues, the air quality index (AQI) is a metric that assesses the state of the air in relation to the needs of one or more living organisms or any human necessity.The Air Quality Index (AQI) employs a quantitative scale that is delineated by distinct hues to represent varying ranges. The scale is designed to assign a numerical value ranging from zero, indicating the optimal air quality, to a value exceeding 300, indicating the most precarious air quality. The Air Quality Index (AQI), also known as PSI (Pollutant Standards Index), classifies atmospheric conditions into six primary indicators. The increasing severity of potential harm to human health is denoted by distinct colours. In general, the colour green is utilised as a signal of favourable air quality, while other hues signify progressively deteriorating conditions, ranging from moderately detrimental for individuals with sensitivities to unhealthy, very unhealthy, and ultimately hazardous. The variation in ranges and codes is contingent upon the classification system employed by the respective country.

SOURCES OF AIR POLLUTION

There are numerous entry points for pollution into Earth's atmosphere. Human activity, such as the use of fossil fuels, the production and transportation of manufactured goods, and the use of manufactured and aerosolized products, accounts for the vast majority of the world's air pollution. Air pollution includes exposure to secondhand smoke from cigarettes. Anthropogenic sources refer to those that are caused by human activity.

Naturally occurring air pollutants include smoke from wildfires and volcanic ash. Natural sources refer to resources that are derived from the environment without any human intervention.

Metropolitan regions are especially susceptible to atmospheric contamination due to the accumulation of pollutants emanating from multiple origins. In specific instances, natural topographical features such as mountains or artificially constructed edifices can serve as containment mechanisms for air pollution. Frequently manifesting as a gaseous mass, the contaminated atmosphere poses a challenge to discerning visual acuity. The term "smog" is commonly used as an abbreviated form of the phrase "smoke and fog." The term "smog" is a linguistic blend of the lexemes "smoke" and "fog."

The prevalence of air pollution is observed to be higher in metropolitan areas of economically disadvantaged nations as compared to affluent ones. According to the World Health Organisation (WHO), Karachi in Pakistan, New Delhi in India, Beijing in China, Lima in Peru, and Cairo in Egypt are among the most polluted cities globally. Regrettably, air pollution is a prevalent concern in numerous industrialised countries. The metropolis of Los Angeles, California is frequently referred to as Smog City.

Indoor Air Pollution

Most people associate air pollution with the fumes released by factories and cars. On the other hand, there are numerous forms of indoor air pollution.

Indoor air quality might be compromised when kerosene, wood or coal are burned for heating purposes. Ashes and smoke irritate the respiratory system and can cling to surfaces, edibles, and clothing.

Radon gas, which occurs naturally but is carcinogenic, can accumulate in dwellings. The surface of the Earth is a major source of radon emission. Radon levels can be lowered with little expense using equipment installed by experts.

Insulation is just one example of a potentially hazardous component of the building industry. Toxic mould can also spread through a building or room if there is adequate airflow. A single mould colony could be hiding in a dark, damp corner of your home, such the space between the walls. Mould spores can easily disperse through a home's air supply. Inhaling the spores can make people ill.

DESTRUCTIVE IMPACT ON HUMAN HEALTH

Exposure to air pollution has numerous negative consequences on human health. The outcomes might be categorised as either immediate or delayed. Symptoms that only last a short time include respiratory infections like pneumonia and bronchitis. Discomfort is also one of these, and it can manifest in a variety of ways. Headaches, dizziness, and nausea are among other symptoms brought on by toxic air. Air pollution also includes odours from sources including waste dumps, factories, and sewage treatment plants. Smells like this aren't as dangerous, but they're still not nice.

The deleterious effects of air pollution can be long-lasting and severe. These entities have the potential to cause fatalities. The correlation between air pollution and various health conditions such as cardiovascular disease, lung cancer, and respiratory illnesses, including emphysema, has been established in human populations. Prolonged exposure to contaminated air has the potential to cause detrimental effects on crucial bodily organs such as the brain, kidneys, and liver. Certain studies suggest that air pollution could be a contributing factor to the occurrence of congenital anomalies. Air pollution is accountable for approximately 2.5 million fatalities globally on a yearly basis.

The impact of diverse types of air pollution on human beings exhibits variability. The impact of pollution may be more pronounced among young children and the elderly due to their relatively underdeveloped immune systems during these life stages. The exacerbation of asthma, cardiovascular ailments, and pulmonary disorders is a well-established consequence of air pollution. The duration, magnitude, and makeup of exposure to pollutants are significant factors to take into account.

The adverse effects of air pollution on human health are noteworthy. Exposure to particles can lead to nasal inflammation and irritation. Experiencing rhinorrhea is an additional potential adverse outcome.

The presence of air pollution has been linked to a reduction in lung function and the occurrence of damage to the lungs.

Air pollution has been found to have inflammatory effects on the cardiovascular system, resulting in the exacerbation of preexisting cardiac problems and an increase in blood pressure.

Prolonged exposure to contaminated air significantly increases the likelihood of mortality. Individuals with a pre-existing compromised cardiovascular system are particularly susceptible.

Health hazards

Air toxicants refer to any extraneous substances that are of foreign origin and have the potential to disrupt the normal functioning of human organs. Based on current evidence, the respiratory, cardiovascular, ophthalmologic, dermatologic, neuropsychiatric, hematologic, immunologic, and reproductive systems are identified as being particularly susceptible to the deleterious effects of exposure to air pollution. Prolonged exposure to molecular and cellular damage has been found to be associated with the development of various forms of cancer. Empirical evidence suggests that certain groups, including but not limited to minors, senior citizens, and individuals with respiratory or cardiovascular conditions, are especially susceptible to adverse health effects resulting from exposure to air pollutants, even at concentrations below regulatory thresholds.

Respiratory disorders

The respiratory system assumes a pivotal role in combating the onset and exacerbation of illnesses resulting from exposure to atmospheric pollution, given that the majority of pollutants infiltrate the body via the respiratory tract. The extent of harm inflicted upon the respiratory system is directly correlated with the quantity of contaminants inhaled and the frequency of their deposition in the designated cellular sites. The primary manifestation of the initial impact is inflammation, which primarily affects the trachea and results in vocal complications. Certain respiratory ailments such as asthma and lung cancer are known to have air pollution as a significant environmental hazard. The respiratory system is susceptible to the deleterious impact of air pollution, particularly particulate matter (PM) and other inhalable substances such as dust, ozone, and benzene. The inhalation of air pollutants has been linked to the onset of asthma, a respiratory condition. Several studies have established a correlation between exposure to air pollution from vehicular and/or industrial sources and the incidence of chronic obstructive pulmonary disease (COPD). Respiratory ailments that are associated with air pollution are managed similarly to those induced by other noxious substances.

Cardiovascular dysfunctions

Numerous studies, including experimental and epidemiological investigations, have established a correlation between exposure to air pollutants and an elevated susceptibility to cardiovascular disease. There is a correlation between changes in the levels of white blood cells and air pollution, which may potentially result in cardiovascular consequences. Nevertheless, a research conducted on animal models has provided compelling evidence establishing a correlation between hypertension and exposure to air pollution. Exposure to traffic-related air pollution, particularly elevated levels of NO2, has been found to be associated with hypertrophy of the right and left ventricles. It is recommended that the conventional treatment for cardiovascular ailments be administered alongside antidote therapy, which is currently only available for a limited number of cardiotoxic substances such as carbon monoxide.

Neuropsychiatric complications

The impact of air pollution on the nervous system has been a subject of ongoing discourse. Nonetheless, contemporary studies indicate that the exposure to such toxins can result in detrimental effects on the central nervous system. The detrimental impact of air pollution on the nervous system can result in adverse physical and mental health outcomes. The impact of neurological impairment, particularly in infants, can be profoundly detrimental. Conversely, the display of hostile and uncooperative behaviours are characteristic features of psychiatric disorders. Recent studies have established a correlation between air pollution and neurobehavioral hyperactivity, criminality, and inappropriate behaviour in children. Exposure to air pollution has been associated with the development of neuroinflammation, Alzheimer's disease, and Parkinson's disease. Several studies have established a correlation between elevated levels of air pollution in densely populated urban areas and a rise in aggressive and anxious conduct.

Other long-term complications

The integumentary system is the largest organ of the human body and serves as the primary barrier against pathogenic microorganisms and infectious agents. However, it is susceptible to contamination and can be the initial site of exposure to pollutants. The skin is a significant target for the absorption of environmental toxins, as it has been found to absorb a comparable amount of toxins as the lungs. Studies conducted on the skin have established a correlation between exposure to traffic-related air pollutants such as PAHs, VOCs, oxides, and PM and the manifestation of pigmented facial spots and accelerated skin ageing.

Theoretically, exposure to hazardous air pollutants through inhalation or dermal absorption may result in harm to internal organs. The aforementioned contaminants comprise of compounds that are recognised to induce carcinogenicity in the liver. Several empirical studies have established a correlation between exposure to air pollutants, specifically those related to traffic, and a heightened susceptibility to autistic spectrum disorders in children. A hypothesised mechanistic pathway for autism and other neurological disorders posits that

endocrine disruption may occur due to chemical components of pollutants. Some studies have found a correlation between exposure to air pollution and negative impacts on foetal development, such as decreased head size, slower growth, and lower birth weight.

The potential impact of environmental factors, such as suboptimal air quality, on the pathogenesis or advancement of various immune system-related ailments cannot be overlooked. Poor air quality can lead to various immune system issues in individuals, including chronic inflammatory respiratory illnesses and abnormal elevations in blood levels of immunoglobulins such as IgA, IgM, and complement component C3. Exposure to immunotoxicants may lead to neuroinflammation, an altered innate immune response in the brain, and subsequent immunological dysfunction at different stages. The presence of air pollution has been observed to induce a modification in the process of antigen presentation, whereby macrophages are stimulated to increase their production of the costimulatory molecules CD80 and CD86.

The ocular system is notably vulnerable to harm caused by atmospheric contaminants, encompassing those emanating from routine origins. The clinical manifestations of air pollution on ocular health vary from being asymptomatic to inducing severe symptoms such as dry eye syndrome. Exposure to air pollution over a prolonged period has been associated with an elevated susceptibility to retinopathy and other ocular complications. Increasing evidence suggests a correlation between air pollution and various ocular discomforts, including severe blindness and dry eye syndrome. Research has demonstrated that heightened concentrations of atmospheric pollutants are linked to a transient increase in the volume of individuals seeking medical attention at the emergency department of ophthalmology.

Effects on the Environment

The impact of air pollution is not limited to individuals but can also extend to ecosystems. Haze, akin to smog, is a conspicuous manifestation of air pollution that impedes the discernment of environmental details. The presence of smoggy air frequently results in the attenuation of noise.

Airborne pollutants inevitably settle back onto the Earth's surface. The susceptibility of surface water and soil to contamination is notably heightened by air pollution. The occurrence has the potential to result in a reduction in crop yield or a decline in overall productivity. The detrimental impact of this phenomenon on the growth and survival of developing trees and other plant species can ultimately result in fatality.

The formation of acid rain occurs when atmospheric sulphur dioxide and nitrogen oxide particulates undergo a chemical reaction with water and oxygen. The primary sources of these atmospheric contaminants are derived from utilities and transportation systems that rely on fossil fuels. The deleterious effects of acid rain on plants are attributed to its ability to modify soil composition, degrade the quality of water in aquatic systems, impair crop productivity, and accelerate the decay of historical edifices.

The detrimental impact of air pollution on both human and animal health is well-established. The correlation between air pollution and various health issues, such as decreased fertility rates and congenital malformations, has been established.

Global Warming

Air pollution emanates from both anthropogenic and natural sources, and both have a role in exacerbating the phenomenon of global warming. The phrase denotes the global phenomenon of escalating atmospheric and aquatic temperatures. The rise in temperature can be attributed to or is possibly caused by the augmentation of greenhouse gases in the atmosphere. The atmosphere of the Earth comprises of greenhouse gases that have the ability to confine thermal energy. Usually, a greater amount of thermal energy emanating from the Earth is dissipated into the vacuum of outer space.

Carbon dioxide, a greenhouse gas, has made the most notable impact on global warming. The combustion of fossil fuels, such as coal, petroleum, and natural gas, results in the emission of carbon dioxide into the atmosphere. Fossil fuels play a crucial role in facilitating the functioning of various human-made contrivances, such as automobiles, aeroplanes, residential and commercial establishments. The emission of carbon dioxide is a consequence of these human activities.

Methane, nitrous oxide, and fluorinated gases are among the additional greenhouse gases that are released into the atmosphere by both anthropogenic and natural sources. Methane emissions of notable magnitude are generated by coal-fired power plants and livestock operations. Nitrous oxide is a greenhouse gas that is emitted into the atmosphere through various anthropogenic activities such as industrial processes, agricultural practises, and the combustion of fossil fuels in transportation. Manufacturing facilities emit hydrofluorocarbons and other fluorinated gases. Fluorinated gases have been increasingly replacing chlorofluorocarbons (CFCs) as a prevalent greenhouse gas. Due to their detrimental effect on the ozone layer, numerous nations have prohibited the utilisation of CFCs.

Numerous countries have implemented limitations or regulations on their emissions of greenhouse gases as a measure to mitigate global warming. The Kyoto Protocol, signed in Japan in 1997, was endorsed by

183 nations who pledged to undertake measures aimed at mitigating their carbon dioxide emissions. The United States has not ratified that treaty.

II. CONCLUSIONS

The dangers to human health posed by air pollution are of grave concern. Many different diseases can cause a wide variety of other, often fatal, conditions. Air pollution can increase the risk of diseases including chronic bronchitis and lung cancer.

The connection between poor air quality and respiratory problems is plain to see. However, it is also recognized that the respiratory and neurological systems are negatively impacted by air pollution. Any preexisting disorders may become worse when foreign substances enter the nasal canal and irritate the lining, leading the body to react as though to an infection.

Extremely high rates of illness and death can be attributed to air pollution, and this is especially true in economically growing nations like Iran. As a result, addressing air pollution must be a major priority for national governments. The Indian government has taken many steps to reduce air pollution in the country. Laws prohibiting and setting standards for emissions of air pollutants need to be enacted by the government as well. Air pollution rules and regulations in these nations need to be brought up to date by policymakers and legislators. An effective environmental protection agency must steer coordination between agencies dealing with air pollution. An effective environmental protection agency will have sufficient funds for management, investigation, creation, observation, and management of all environmental factors, including air pollution. Industries have had electrostatic precipitators installed in their chimneys to reduce the release of harmful particles into the air. Alternative and renewable energy sources should be seriously considered as a means of lowering pollution levels. It is important to encourage traffic officers and others who are frequently exposed to harmful air pollution to use breathing masks.

REFERENCES

[1]. Robinson DL. Air pollution in Australia: Review of costs, sources and potential solutions. Health Promot J Austr. 2005;16:213–20. [PubMed] [Google Scholar]
[2]. https://education.nationalgeographic.org/resource/air-pollution/]
[3]. Zhou N, Cui Z, Yang S, Han X, Chen G, Zhou Z, et al. Air pollution and decreased semen quality: A comparative study of Chongqing urban and rural areas. Environ Pollut. 2014;187:145–52. [PubMed] [Google Scholar]
[4]. Chen B, Kan H. Air pollution and population health: A global challenge. Environ Health Prev Med. 2008;13:94–101. [PMC free article] [PubMed] [Google Scholar]
[5]. WHO. Database: Outdoor Air Pollution in Cities; 2003-2010. Available from: http://www.who.int/phe/health_topics/outdoorair/databases/cities-2011/en/
[6]. Mawer C. Air pollution in Iran. BMJ. 2014;348:g1586. [PubMed] [Google Scholar]
[7]. Vallero D. Fundamentals of Air Pollution. 4th ed. California, USA: Academic Press; 2007. [Google Scholar]
[8]. Catcott EJ. Effects of air pollution on animals. Monogr Ser World Health Organ. 1961;46:221–31. [PubMed] [Google Scholar]
[9]. Schneider SH. The greenhouse effect: Science and policy. Science. 1989;243:771–81. [PubMed] [Google Scholar]
[10]. Bentayeb M, Simoni M, Norback D, Baldacci S, Maio S, Viegi G, et al. Indoor air pollution and respiratory health in the elderly. J Environ Sci Health A Tox Hazard Subst Environ Eng. 2013;48:1783–9. [PubMed] [Google Scholar]