

## AN OVERVIEW ON EFFECT OF AIR POLLUTION ON HUMAN HEALTH

Dr. Anil Ahuja\*; Deepti Mathpal\*\*

\*SOP, Sanskriti University,  
Mathura, Uttar Pradesh, INDIA  
Email Id- principal.ips@sanskriti.edu.in,

\*\*SOP, Sanskriti University,  
Mathura, Uttar Pradesh, INDIA  
Email id:deepti.ips@sanskriti.edu.in

DOI: **10.5958/2249-7137.2021.02586.6**

---

### ABSTRACT

*The Human Health is inextricably linked to the surroundings. Impact of the air pollution on the human health has been a fascinating topic that has sparked a lot of study in the past 50 years. Polluted air is thought to be one of the main causes of many illnesses in humans, including cardiovascular and respiratory disease, as well as lung cancer. Furthermore, air pollution has a negative impact on animals and degrades the plant ecosystem. The total goal of the study is to look at past studies on the origins & source of the air pollution, as well as to manage it as well as its negative impacts on people's healthiness. Definition of the air pollution, as well as their causes, were thoroughly discussed. The impacts of major air contaminants were described in depth. Air pollution's negative effects on the human health were also discussed.*

**KEYWORDS:** *Air Pollution, Major Air Pollutants, Human Health, Harmful Effects, Cardiovascular Disease, Respiratory Disease, Asthma.*

---

### 1. INTRODUCTION

Contamination of ambient atmospheric by chemical compounds, gases, or particle matter is known as air pollution. Each year, these polluting elements may cause discomfort, illnesses, and millions of fatalities. They may also harm plants as well as other living things like animals and food crops. These polluting elements may also cause smog and acid rain, resulting in respiratory and cancer illnesses as well as ozone layer depletion, which contributes to global warming (1). Air pollution has a negative impact on labor productivity, agricultural worker work hours, and school student cognitive performance. The primary goal of this review is to investigate prior recent research on air contamination & its negative impacts on the human health & well-being. The many kinds of main atmosphere contaminants, as well as their various origins, were discussed. The link between air pollution levels and cardiovascular, respiratory, and lung malignancies.

In 1999, the World Health Organization defines as air pollution's "substance emitted by the human activity in sufficient concentration to the have negative effects on the health, agricultural

crop production, vegetation, or the enjoyment of property.” Pollutants are natural or manmade substances that damage the environment (2).

To have a pollutant impact in the atmosphere, the pollutant must first be discharged and chemically mixed or changed, after which it affect the receptor, such as humans, animal, plant, or any other substance. Air pollutions may be classified into two groups based on the source: ordinary or pollution due to human activities, & stationary or moving pollution. Jungle fires, dust storms, volcanic eruptions, gasses produced by radioactive decaying of the earth's crusts are examples of natural pollutants. As part of the digestion process, cattle and other animals may release methane. Pine trees also produce volatile organic chemicals (VOCs). Natural pollutants have a little impact on our environment due to their capacity to regenerate (3).

Human activities cause anthropogenic (man-made) pollution. There are three types of man-made air pollution sources: point sources, area sources, and line sources. Point sources are confined, stationary, and originate from big facilities or locations where a significant amount of air-polluting pollutants is produced during industrial operations. The oil refinery, power plant, steel work, foundry, paper mill, chemical station, wood as well as pulp processor, as well as storage and disposal facility are examples of point sources. The majority of human made point source release pollutants chemicals into atmospheric through chimney that are high enough in the sky to allow significant contaminants. Certainly meteorological circumstances, like low temperatures & wind, as well as highly stable atmospheric, may hinder or a decrease effectiveness of dispersions, causing pollutant to get confined around the points sources as well as fall to the ground surfaces, resulting in degradation of air quality (4).

## **2. MAJOR AIR POLLUTION**

As previously stated, there are many air contaminants that have been categorized and have negative effects on the individual health, plants, and animals. Detrimental effects of the pollutant are mostly determined by the quantity and duration of exposure, as well as the kind of pollutants and their accumulation over time. Nitrogen oxide, carbon monoxide, sulfur oxide, ground-level ozone, volatile air compounds (VOCs), lead, and particulate matter are examples of “criteria air pollutants” or approximately “basic pollutants.”

### **2.1. Carbon Monoxide (CO):**

The Carbon monoxide, the dangerous contaminant in the atmosphere. It is odorless, colorless, & tasteless gas which does not dissolve in water. It has a little lower density than air. Humans are poisoned by it, and it merely interacts with hemoglobin to produce carboxyhemoglobin (COHb).

Carbon monoxide is projected to be released into the atmosphere at a global rate of 2600 million tons per year. 60 percent comes from human-made activity, while the remainder comes from natural processes. CO emissions from humans are mostly caused by incomplete combustion of carbonaceous materials. The exhaust from gasoline-powered vehicles accounts for the majority of these pollutants (5). Other common sources include various industrial operations, trash incineration, and coal-fired power stations. Heaters and furnaces that are not adequately maintained also produce carbon monoxide.

### **2.2. Nitrogen Oxides (Nox):**

Nitrogen oxides (NO<sub>x</sub>) are a category of polluting gases that include stable oxides as a consequence of the interaction between nitrogen and oxygen. NO<sub>x</sub> is made up of seven distinct chemicals. Volcanic eruptions, thunderstorm lightning, and soil emissions may all produce these chemicals at a low level. However, human action like burning of fuels in the motor vehicle and stationary source is primary sources of nitrogen oxide. The road traffic is biggest producer of nitrogen oxides (NO<sub>x</sub>), accounting for about 39% of total NO<sub>x</sub> emissions.

The nitric oxide (NO) & nitrogen dioxide (NO<sub>2</sub>) are two most significant & prevalent NO<sub>x</sub> molecules among these seven. The most common source of nitric oxide (NO) is the high-temperature combustion of fossil fuels. The nitric oxide are converted to nitrogen dioxide (NO<sub>2</sub>) in atmosphere when it is oxidized by atmospheric oxidants like ozone. The oxidation process happens quickly even at low levels of reactants in the environment (6).

### **2.3. Sulfur Oxides (Sox):**

Sulfur oxide are divided into types: sulfur dioxide (SO<sub>2</sub>) and sulfur trioxide (SO<sub>3</sub>). Sulfur dioxides is colorless, acidic gas with a noxious odor. Chemically, it is a reducing agent since it sends off electrons while receiving oxygen. As a result, it's extensively employed as a bleaching agent, a grain & citrus food fumigant, & disinfectant in breweries & food mill, as well as in the food preservation. SO<sub>2</sub> is a common air pollutant that may be produced naturally, such as from volcanoes, or anthropogenic ally, such as through the burning of fuels & biomass at big industrial facilities like oil refinery & power plants. Oceans, soils, and plants may also release volatile organic sulfur compounds.

Sulfur compounds are one of the most common air pollutants, according to reports, and they play an important roles in altering chemistry of earth's atmospheres. For example, they have a significant impact on the weather and climate. SO<sub>2</sub> is recognized as most of the corrosive gas in atmosphere, particularly when additional contaminants are present. Under low humidity, nitrogen dioxides increased SO<sub>2</sub> corrosively by twofold. In the presence of O<sub>3</sub>, the corrosively of SO<sub>2</sub> is greater than in presence of NO<sub>2</sub>.

### **2.4. Particulate Matter (2.3):**

Particulate matter in the air is one of the most common contaminants in the atmosphere. This is due to the fact that human breath is combination of extremely small solid and liquid particles in the ambient air. Particulate matter may be categorized as coarser particles with an aerodynamic diameter of less than or equal to 10 m (PM<sub>10</sub>), or tiny particles having an aerodynamic diameter of less than or equal to 2.5 m. Ultra-fine particulate matter, on the other hand, has a diameter of less than 0.1 mi s. Particulate matter may be naturally or anthropogenic ally emitted into the atmosphere (7). Volcanic eruptions, mineral dust, sea salt, and wildfires are among natural sources of particulate matter. Fuel combustion, industrial emissions, burning biomass, road dust, and combustion in car engines and heating boilers are all examples of anthropogenic activities that contribute to particulate matter in the atmosphere.

## **3. HARMFUL EFFECTS OF AIR POLLUTION**

Air pollution is widely recognized to be one of the leading causes of severe human health problems such as cardiovascular and respiratory diseases. Numerous studies have shown the negative effects of air pollution on productivity, behavior, and well-being of people who are

exposed. It was also shown that air pollution had a negative impact on agricultural employees' productivity and working hours.

### **3.1. Respiratory Illnesses:**

To have a pollutant impact in the atmosphere, the pollutant must first be discharged and chemically mixed or changed, after which it affect the receptor, such as humans, animal, plant, or any other substance. Air pollutions may be classified into two groups based on the source: ordinary or pollution due to human activities, & stationary or moving pollution. Jungle fires, dust storms, volcanic eruptions, gasses produced by radioactive decaying of the earth's crusts are examples of natural pollutants. The effects of gender and age were also looked at. Males were shown to be more affected by SO<sub>2</sub> and PM<sub>10</sub> than females, while the elderly were found to be more affected than young individuals. The impact of NO<sub>2</sub> was shown to be more apparent in youngsters, particularly those under the age of 15. For PM<sub>10</sub>, SO<sub>2</sub>, and NO<sub>2</sub>, increasing ambient air pollution by roughly 10 g/m<sup>3</sup> resulted with increases in emergency department admissions of 2.8 percent, 3.6 percent, and 7.7 percent, respectively (8).

The interplay of severe weather and air pollutants, especially PM<sub>10</sub>, and their effects on respiratory hospital admission were investigated. It was shown that respiratory hospital admissions rise substantially during hot, dry weather, which is accompanied by high water vapor, as well as during cold, overcast days, which are linked with higher precipitation levels.

The researchers looked at the link between key air pollutants including SO<sub>2</sub>, NO<sub>2</sub>, and PM<sub>10</sub> and respiratory illness and lung cancer mortality. With an increase of 10 g/m<sup>3</sup> in SO<sub>2</sub>, NO<sub>2</sub>, and PM<sub>10</sub>, it was calculated that the proportion of respiratory illness mortality rose by around 7.69%, 4.38%, and 1.55 percent, respectively. The only air pollutant that was shown to be linked to lung cancer mortality was SO<sub>2</sub>.

### **3.2. Asthma:**

Asthma is a kind of inflammatory lung disease that affects individuals of all ages and leads to an increase in mortality and morbidity. Asthma affects about 300 million individuals worldwide, with an ongoing rise in the number of children and young adults, as shown in recent years. In China, for example, the number of asthma sufferers reached 30 million among 2010, and 7 million in American children and teenagers under the age of 18 in 2012. Numerous papers have looked into the effect of air pollution on the development of asthma, particularly in youngsters (9).

### **3.3. Cancer:**

Because of the accumulating evidence from researchers across the world showing air pollutants are predisposing factors to lung, nasopharyngeal, head, and neck cancer, the WHO has classified air pollution to be a human carcinogen. It was also stated that ambient air pollution is the main cause of cancer mortality; furthermore, particulate matter may enter the alveoli depending on its size. PM may induce carcinogenesis in the respiratory system when it travels to the alveoli. The researchers also discovered that lung cancer is responsible for 7% of all deaths caused by PM<sub>2.5</sub> exposure.

To have a pollutant impact in the atmosphere, the pollutant must first be discharged and chemically mixed or changed, after which it affect the receptor, such as humans, animal, plant, or

---

any other substance. Air pollutions may be classified into two groups based on the source: ordinary or pollution due to human activities, & stationary or moving pollution. Jungle fires, dust storms, volcanic eruptions, gasses produced by radioactive decaying of the earth's crusts are examples of natural pollutants. As part of the digestion process, cattle and other animals may release methane. Pine trees also produce volatile organic chemicals (VOCs). Natural pollutants have a little impact on our environment due to their capacity to regenerate.

### **3.4. COPD (Chronic Obstructive Pulmonary Disease):**

COPD, which includes bronchial asthma, chronic bronchitis, and pulmonary emphysema, is one of the leading causes of morbidity and death in the United States. COPD kills more than 3.2 million people per year across the world. COPD is expected to rank fifth among variables with a high societal burden by 2020, and third among the most significant causes of mortality for both genders worldwide. There have been less studies on the link between major air contaminants and COPD. In Sao Paulo, Brazil, Arbex and co-authors investigated the impact of daily concentrations of main air pollutants on COPD emergency department visits. Their results indicated that PM10 and SO<sub>2</sub> exposure had an immediate impact on COPD emergency room visits. COPD admissions increased by 16 percent and 19 percent, respectively, while PM10 and SO<sub>2</sub> levels increased by 28.3 and 7.8 g/m<sup>3</sup>, respectively. Women and the elderly were disproportionately affected by both types of air pollution. In a similar study, researchers discovered that even low amounts of SO<sub>2</sub> exacerbate COPD symptoms. Climate factors, particularly temperature, were discovered to have a synergetic impact.

### **3.5. Cardiovascular Disease (CVD):**

The detrimental effects of breathing air pollutants on the cardiovascular system have been shown beyond reasonable doubt in observational and epidemiologic research. Human activities cause anthropogenic (man-made) pollution. There are three types of man-made air pollution sources: point sources, area sources, and line sources. Point sources are confined, stationary, and originate from big facilities or locations where a significant amount of air-polluting pollutants is produced during industrial operations. The oil refinery, power plant, steel work, foundry, paper mill, chemical station, wood as well as pulp processor, as well as storage and disposal facility are examples of point sources. The majority of human made point source release pollutants chemicals into atmospheric through chimney that are high enough in the sky to allow significant contaminants. Certainly meteorological circumstances, like low temperatures & wind, as well as highly stable atmospheric, may hinder or a decrease effectiveness of dispersions, causing pollutant to get confined around the points sources as well as fall to the ground surfaces, resulting in degradation of air quality. It will have a particularly negative impact on the most vulnerable members of society, such as low-income or elderly people, or those with a history of cardiovascular disease (10).

### **3.6. Diabetes Disease:**

Type 1 diabetes is insulin-dependent and has a childhood start. Type 2 diabetes is insulin-independent and has a childhood onset. Type 2 diabetes, on the other hand, is linked to adult onset. Evidence has accumulated over the past decade suggesting air pollutants such as NO<sub>2</sub>, O<sub>3</sub>, and particulate matter (PM) have deleterious effects on glucose metabolism, affecting insulin sensitivity and hemoglobin A1C. (Hb A1C). People with type 2 diabetes, as well as the general



public. Furthermore, it has been suggested that air pollution may raise the incidence of type 2 diabetes.

It is apparent that experts have paid less attention to the link between air pollution and diabetes. Several studies have looked at the negative consequences of air pollution on diabetes. NO and particulate matter with a diameter of less than 10 m are also found to be the air pollutants that have the greatest impact on diabetes.

### **3.7. Epilepsy Effects:**

Epilepsy is a common neurological disorder characterized by excessive neuronal excitability manifested as uncontrollable and frequent episodes. It is a common and complicated illness that affects over 70 million individuals worldwide, from infants to the elderly. In general, epilepsy's impact is not limited to physical pain; it may also result in mental effects and psychological issues. Air pollution and its link to or effect on epilepsy sufferers is a relatively recent topic that has received little attention from academics. The majority of research rely on data from registries or hospital databases.

### **3.8. Effects on Mumps:**

The mumps virus causes a common pediatric illness known as mumps (Mu V). The primary symptom of this condition is swelling on one or both sides of the parotid gland. Although many research have looked into the impact of climatic factors on mumps epidemics, only a few have looked into the impact of air pollution. The relationship between short-term exposure to ambient air pollution and the incidence of mumps in Wuhan, China has been documented using a time-series research. Their results showed that there is a link between exposure to air pollutants, particularly NO<sub>2</sub> and SO<sub>2</sub>, and an increased chance of getting mumps. The negative impacts of air pollution were more pronounced in the summer than in the winter. It is evident that the link between air pollution and mumps patients is a relatively new topic that has been addressed by a small number of studies. NO<sub>2</sub> and SO<sub>2</sub> are the air pollutants that most often induce mumps illness, particularly in youngsters, according to the research mentioned above.

## **4. DISCUSSION**

Air pollution has a significant and negative impact on human behavior, productivity, and well-being, according to recent research. According to reports, air pollution has a detrimental impact on agricultural laborers' labor productivity. Air pollution, particularly small particulate matter with a diameter of less than 2.5 microns (PM<sub>2.5</sub>), reduces productivity, especially in less physically demanding jobs like communication centers. It has also been discovered that air pollution is linked to behavioral changes and well-being, particularly unethical and illegal conduct, as well as lower levels of perceived pleasure. High levels of stress hormones including adrenaline, cortisone, and cortisol have been linked to fine particulate matter, particularly PM<sub>2.5</sub>. Furthermore, certain PM<sub>2.5</sub> components may pass through the blood-brain barrier and enter the brain. Additionally, increased amounts of stress hormones may result in behavioral changes, particularly an increase in impatience. A substantial increase in air pollution has also been shown to have harmed the productivity of low-skilled industrial and agricultural employees. Because of the rise in the amount of tiny particulate matter below 2.5 m, high school pupils' T-test scores and cognitive function have been harmed (PM<sub>2.5</sub>).

During games, the correct passes are used to evaluate the performance and production of football players. During the seasons 1999/2000 to 2010/2011, the right passes of professional players in the Bundesliga league were studied and linked to ambient air pollution surrounding stadiums. Particulate matter in the ambient air has a detrimental effect on the players' productivity in terms of total number of passes, according to their results. Players of a certain age and those who play in environments that require greater physical effort had the most effect.

Human activities cause anthropogenic (man-made) pollution. There are three types of man-made air pollution sources: point sources, area sources, and line sources. Point sources are confined, stationary, and originate from big facilities or locations where a significant amount of air-polluting pollutants is produced during industrial operations. The oil refinery, power plant, steel work, foundry, paper mill, chemical station, wood as well as pulp processor, as well as storage and disposal facility are examples of point sources. The majority of human made point source release pollutants chemicals into atmospheric through chimney that are high enough in the sky to allow significant contaminants. Certainly meteorological circumstances, like low temperatures & wind, as well as highly stable atmospheric, may hinder or a decrease effectiveness of dispersions, causing pollutant to get confined around the points sources as well as fall to the ground surfaces, resulting in degradation of air quality.

## 5. CONCLUSION

The study of the main causes and negative consequences of air pollution is exploding these days. Air pollution has a negative impact on human health and the environment, as well as a physiological, psychological, and economic impact on society. This review study compiled information from more than 170 peer-reviewed publications on human and natural causes of air pollution. Air pollution's many negative impacts on cardiovascular and respiratory illnesses were also discussed. There were also links discovered between the concentrations of several air contaminants and diabetes, mumps, and epilepsy. Finally, the effects of air pollution on productivity, working hours, and human health are discussed.

## REFERENCES

1. Brown TP, Rushton L, Mugglestone MA, Meechan DF. Health effects of a sulphur dioxide air pollution episode. *J Public Health Med.* 2003;
2. Cai J, Zhao A, Zhao J, Chen R, Wang W, Ha S, et al. Acute effects of air pollution on asthma hospitalization in Shanghai, China. *Environ Pollut.* 2014;
3. Cakmak S, Dales RE, Vidal CB. Air pollution and hospitalization for epilepsy in Chile. *Environ Int.* 2010;
4. Carmichael GR, Adhikary B, Kulkarni S, D'Allura A, Tang Y, Streets D, et al. Asian aerosols: Current and year 2030 distributions and implications to human health and regional climate change. *Environ Sci Technol.* 2009;
5. Chen X. A Spatial and Temporal Analysis of the Socioeconomic Factors Associated with Breast Cancer in Illinois Using Geographically Weighted Generalized Linear Regression. *J Geovisualization Spat Anal.* 2018;
6. Choe SA, Kauderer S, Eliot MN, Glazer KB, Kingsley SL, Carlson L, et al. Air pollution, land use, and complications of pregnancy. *Sci Total Environ.* 2018;

7. Chuang KJ, Yan YH, Chiu SY, Cheng TJ. Long-term air pollution exposure and risk factors for cardiovascular diseases among the elderly in Taiwan. *Occup Environ Med.* 2011;
8. Coppola A, Caccavale C, Santulli L, Balestrini S, Cagnetti C, Licchetta L, et al. Psychiatric comorbidities in patients from seven families with autosomal dominant cortical tremor, myoclonus, and epilepsy. *Epilepsy Behav.* 2016;
9. D'Amato G, Holgate ST, Pawankar R, Ledford DK, Cecchi L, Al-Ahmad M, et al. Meteorological conditions, climate change, new emerging factors, and asthma and related allergic disorders. A statement of the World Allergy Organization. *World Allergy Organization Journal.* 2015.
10. Dai W, Gao J, Cao G, Ouyang F. Chemical composition and source identification of PM2.5 in the suburb of Shenzhen, China. *Atmos Res.* 2013;