

# **11. Air-Pollution: Indian and Assam Scenario, Impact on Human Health and its Control-A Brief Account**

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## **Abstract:**

Air pollution is one of the most important threats to the health and wellbeing of mankind. Human beings need clean air in order to sustain healthy lives. Due to industrialization, there has been increase in the release of gaseous emissions and particulate matter (PM). Air pollution is found to be one of the top ten killers in the world. Globally, around 3% of cardiopulmonary and 5% of lung cancer deaths has been attributed to particulate matter. According to 'India State-Level Disease Burden Initiative Air Pollution Collaborators' India has been estimated to have some of the worst levels of pollutions globally. Thirteen cities of India including Delhi, Patna, Gwalior, Raipur as the top four, have been listed among the top twenty most polluted cities in the world. Various initiatives have been taken by the government of India in order to control air pollution in the country. The improvement in the air quality has been found to have an immediate impact. Thus improving the quality of air can go a long way in improving the health of the general population.

## **11.1 Introduction:**

Air pollution is considered to be one of the largest environmental threat to human health throughout the world (Pandey, A., Brauer, M., Cropper, M. L., et al. 2021). One of the main users of the various resources of the Earth is mankind; thus human beings are either knowingly or unknowingly responsible for environmental pollution (Sarma 2013). Various kinds of anthropogenic emissions are being released into the atmosphere. Such emissions are termed as primary pollutants. The primary pollutants undergo chemical reactions in the atmosphere and lead to the formation of new pollutants. These new pollutants are termed as secondary pollutants. The Air (Prevention and Control of Pollution) Act, 1981 states that 'air pollutant means any solid, liquid or gaseous substance, including noise, present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment' (The Air- Prevention and Control of Pollution Act, 1981).

According to this statement noise pollution is also an important part of air pollution. The World Health Organization estimated that throughout the world around seven million people have died due to the exposure to air pollution. Such deaths were due to exposure to toxic pollutants both indoors as well as outdoors (Ghosh & Parida 2015). Major air pollutants have been categorized into two groups: Outdoor pollutants and Indoor pollutants. Outdoor air pollution refers to the exposure that takes place outside of the built environment.

These include the remains of fossil fuel, carbon particles and metallic particles in the atmosphere from industrial and automobile emissions, toxic gases like nitrogen dioxide, carbon monoxide, sulfur dioxide etc. and ozone, tobacco smoke etc. Indoor air pollution refers to exposures to particulates, carbon oxides, and other pollutants carried by indoor air or dust. Such pollutants include toxic gases produced from kitchen fuels, building materials that is asbestos, lead etc and tobacco smoke etc. (Anon. 2019).

## **11.2 Indian Scenario:**

According to 'India State-Level Disease Burden Initiative Air Pollution Collaborators' India has been estimated to have some of the worst levels of pollutions globally (Balakrishnan K et al. 2018). It has been estimated that thirteen cities of India have been listed among the top twenty most polluted cities in the world; these include Delhi, Patna, Gwalior, Raipur as the top four (Chainey 2015). The population-weighted mean PM<sub>2.5</sub> exposure to particulate matter in India was found to be one of the highest in the world (89.9 µg/m<sup>3</sup> per annum) in the year 2017. It was also found that within India in 2017 Delhi (209.0 µg/m<sup>3</sup> per annum) was leading with the highest population-weighted mean PM<sub>2.5</sub> followed by Uttar Pradesh, Bihar and Haryana in North India (range 125.7-174.7 µg/m<sup>3</sup> per annum) and then Rajasthan, Jharkhand and West Bengal with a range of 81.4-93.4 µg/m<sup>3</sup> per annum (Balakrishnan K et al. 2018). In May 2014 World Health Organization (WHO) found New Delhi to be the most polluted city in the world for PM<sub>2.5</sub> particles (Sedghi 2015). This is due to increase in automobile exhaust as well as coal fueled factories in the cities (Ghosh & Parida 2015).

Assam is one of the eight states of North-Eastern India. The North-Eastern part of India is generally considered to be an environmental friendly state with plentiful greenery. But at present with the increase in the population, increase in number of automobiles as well as industries the air quality of the region has degraded with increase in the amount of toxic pollutants in the atmosphere.

In a study done in five different places of Assam viz. Guwahati, Dibrugarh, Golaghat, Tezpur and Bongaigaon it was found that the concentration of NO<sub>2</sub> and SO<sub>2</sub> was below the prescribed maximum level by the National Ambient Air Quality Standard (NAAQS) of Central Pollution Control Board (CPCB 2011); however the annual average values of respirable particulate matter (RSPM) and suspended particulate matter (SPM) was found to be either high or in critical condition (Barman 2013). This could be due to dryness during the winters, increase in the number of vehicles as well as industries and various other human activities. The three wheeled tempos which run in the roads of the state have been found to release huge amount of toxic air pollutants (Barman 2013).

In the Noonmati area of Guwahati one of the important health hazards is the emissions from the Guwahati Refinery. Even though measures have been taken by the industries under the direction of Guwahati Municipal Corporation, however the general public still continues to suffer from the effects of the pollution (Sarma 2013). Another contributor to the burden of pollution in the city of Guwahati is the Barchala bil which is situated in the heart of the city. The bil has now become the reservoir of sulphurated hydrogen gas due to which the atmosphere of the nearby area gets polluted (Sarma 2013).

### **11.3 Impact of Air Pollution on Health:**

Air pollution is found to be one of the top ten killers in the world (Chandola 2013). Globally, around 3% of cardiopulmonary and 5% of lung cancer deaths has been attributed to particulate matter. Studies have found that air pollution is the sixth most deadly killer in South East Asia and the fifth largest killer in India (Iyengar 2014). It has been estimated that in the year 2017 around 1.24 million (12.5%) deaths in India were attributable to air pollution which increased to 1.67 million deaths in the year 2019 (Balakrishnan K et al. 2018; Pandey, A., Brauer, M., Cropper, M. L., et al. 2021). Around 0.67 million deaths in India in 2017 were attributed to ambient particulate matter pollution while 0.48 million deaths were attributed to household air pollution. An increase of 1.7 years life expectancy would have been possible in India if the pollution levels had been lower than the minimum levels associated with health loss (Balakrishnan K et al. 2018).

Exposure to air pollution has been found to be associated with various health problems including cardiovascular disorders, hypertension, bronchitis, respiratory distress, dermatitis etc. (Chainey 2015). Very small particles (less than 2.5 micrometer in diameter) are capable of entering into the respiratory system and causing fatal physiological consequences (Chandola 2013).

It has been estimated that particulate air pollution account for 19% of all cardiovascular deaths, 23% of all ischemic heart disease deaths, and 21% of all stroke deaths (Hadley, Baumgartner & Vedanthan 2018). Strong association have been found between particulate air pollution and increased risk of cardiovascular disease mortality, myocardial infarction, stroke, and hospital admission for congestive heart failure (Brook et al. 2004). According to a study very small sized particulate matter in the respiratory air is responsible for hypertension (Iyengar 2014). A 26-city US survey revealed that a 10  $\mu\text{g}/\text{m}^3$  increase in PM<sub>2.5</sub> in a 2-day period was associated with an approximately 2% increase in myocardial infarctions and hospital admissions for heart failure (Zanobetti et al. 2009). According to Sorensen et al air pollution as well as traffic noise may be linked with higher levels of cholesterol (Sorensen et al. 2015). In India, 38% of the disease burden on account of air pollution is due to cardiovascular diseases and diabetes.

Various studies have found that air pollution is associated with type 2 diabetes mellitus (Eze et al. 2015). Among both diabetic as well as non-diabetic individuals, exposure to PM<sub>2.5</sub> and NO<sub>2</sub> has been found to be linked with the prevalence of diabetes and increase in the glycosylated hemoglobin levels (Honda et al. 2017). Higher morbidity as well as mortality due to air pollution has been found among individuals with diabetes (Raaschou-Nielsen et al. 2013; Schraufnagel et al. 2019). Dendup et al in the year 2018 revealed that higher levels of NO<sub>2</sub>, PM<sub>2.5</sub> and noise are associated with increased risk of developing type 2 diabetes mellitus (Dendup et al. 2018).

It has been estimated that ambient air pollution is the major cause behind the death of more than 800,000 individuals from COPD and 280,000 individuals from lung cancer (Cohen et al. 2017). Death of more than 750,000 individuals from COPD and 300,000 individuals from lung cancer have been attributed to indoor air pollution (Gordon et al. 2014; WHO 2018). Delhi has been marked as the asthma capital of India (Dubey 2009).

Increase in air pollution has also been associated with the increase in the prevalence of hepatic steatosis (Li et al. 2017). Study conducted among 23,820 individuals for a median of 16.9 years revealed the association of exposure to PM<sub>2.5</sub> with an increased risk of hepatocellular cancer (Pan et al. 2016).

Studies have found that due to air pollution allergic reactions among sensitized persons can aggravate. Air pollution is found to be linked with enhancement of allergic sensitization among young children and also with the increase in IgE levels in the very young (Majkowska-Wojciechowska et al. 2007; Patel et al 2011).

Air pollution is found to affect a lot of biologic parameters which in turn influence the quality of one's skin. These include changes in the composition and excretion rate of sebum, carbonylated protein level in the stratum corneum, and a higher erythematous index on the face of highly exposed subjects (Lefebvre et al. 2015).

Such changes may result in an increase in the occurrence of acne among individuals exposed to air pollution (Liu et al. 2018). Air pollution is found to be linked with high frequency of atopic and urticarial skin disease, dermatographism, and seborrhea (but a lower frequency of dandruff) (Lefebvre et al. 2015).

### **11.3.1 Air Pollution Control in India:**

Various initiatives have been taken by the government of India in order to control air pollution in the country. Such initiatives include reduction in the emission of particulate matter by coal power plants as well as reduction in consumption of energy by industries by the Ministry of Power, standard for emission have been set for industries of brick manufacture as well as reduction in stubble burning in agriculture by Ministry of Environment, regulation of emissions by vehicles by Ministry of Road Transport and Highways and Ministry of Petroleum and Natural Gas and improving the availability of public transport by Ministry of Urban Development (Balakrishnan K et al. 2018). The Government has banned the running of vehicles which are more than 15 years old on the roads of Delhi (Ghosh & Parida 2015). The government has also taken up various steps in order to reduce the number of vehicles that use diesel on the roads of Delhi (Sedghi 2015). In order to reduce the emission of particulate matter into the environment electrostatic precipitators have been added to the chimneys of the industries (Ghosh & Parida 2015). The Prime Minister of India in the year 2016 initiated the scheme 'The Pradhan Mantri Ujjwala Yojana' in order to reduce solid fuel use among households.

According to this scheme 50 million low-income households were planned to be provided with clean and safe cooking fuel (liquefied petroleum gas) by the month of March, 2019. However, the original target of the scheme was met in the month of August, 2018 and thus the government has now increased the target to reach 8 crores with budgetary allocation of Rs 12,800 crore (Press Information Bureau, 2018). Clean Air for Delhi Campaign was launched in the year 2018. This campaign later led to the initiation of the National Clean Air Program. The aim of the National Clean Air Program is 'to sensitize the public and enhance coordination between the implementing agencies for control of air pollution across the country' (Balakrishnan K et al. 2018).

Similar initiatives include ‘The Intended Nationally Determined Contributions’. This initiative targets ‘to reduce particulate matter emission intensity by 33–35% by 2030, promotion of electric public transport fleets, and upgrading vehicles to Bharat Stage VI (which is equivalent to Euro-VI standard) vehicle emission standards’ (Ministry of Petroleum and Natural Gas, 2014; Press Information Bureau, 2015; Press Information Bureau, 2016).

#### **11.4 Conclusion:**

The World Health Organization has termed air pollution as ‘Silent Killer’. Various studies continue to reveal the harmful effects of air pollution on public health. However, it is possible to address the problem of air pollution and improve the air quality. The findings of such studies must be taken into account for the development of strategies to mitigate the harmful effects of toxic pollutants. Numerous steps have been taken by the government of India in order to tackle this problem in various parts of the country in the form of schemes, laws etc. Alternative and renewable sources of energy must be considered in order to reduce pollution. The improvement in the air quality has been found to have an immediate impact. Thus improving the quality of air can go a long way in improving the health of the general population. Also short term measures such as use of respiratory mask must be encouraged among individuals who are regularly exposed to toxic air pollutants.

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