International Journal of Advance Research in Science and Engineering
Volume No.10, Issue No. 05, May 2021
www.ijarse.com
IJARSE
ISSN: 2319-8354

# A review on Air Pollution due to Vehicular Emission and its Effects on Human Health

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**ABSTRACT**

*Effect of vehicular air pollution on human health is a serious issue. Air pollution causing 2 million premature deaths of Indian every year and 27% of total air pollution is caused by vehicular emission. The increasing urbanization in India is the main reason for the rapid increase in number of vehicles and thus responsible for vehicular pollution. It causes threat to the human health. The ill effects caused due to air pollution are chronic respiratory diseases, cancer, cardiovascular disease, skin irritation, and other diseases etc. All these ill effects indicating alarming situation. There is need to overcome the issue of vehicular air pollution. This paper is a review of effects of vehicular emission and its effects on human health*

***Key-words:Pollution Effect, Vehicular Emission, Health effect, premature deaths, Diseases.***

## I. INTRODUCTION

The impact of vehicular air pollution in India is a serious health issue. At least 140 million people in India breathe air that is 10 times or more above the WHO safe standard, as per a report based on 2016 data, and 13 of the 20 cities in the world with the highest annual levels of air pollution are in India. The vehicle is accountable for 27 per cent of the pollution. Air pollution contributes to the premature death of 2 million Indians every year. India has low per CapitaGreenhouse gas emissions, but the country as a whole is the third largest producer of greenhouse gas emissions after China and the United States (WHO).The Air (Prevention and Pollution Control) Act was adopted in 1981 to reduce air pollution.The Government of India and IIT Kanpur launched the National Air QualityIndex in 2015.In 2019; the Indian Government launched the National Clean Air Program with a national target of 20% to 30% reduction in PM2.5and PM10 concentrations by 2024, taking 2017 as the base year for comparison. In December 2019, IIT Bombay and the McKelvey School of Engineering of

Washington University in St. Louis jointly launched the Aerosol and Air Quality Research Facility to study air pollution in India.

## II. THE EFFECTS ON HUMAN HEALTH AND ENVIRONMENT.

The ill effects on human health and environment because of the pollutants emitted from vehicles are summarized as below:

**1. Carbon monoxide**:

CO inhalation causes vomiting, nausea, headache, and dizziness. If the CO level is high enough, one may become unconscious or die. Exposure to CO over a long period of time will increase the risk of heart disease. Motor vehicles makea significant contribution to ambient carbon monoxide (CO) concentrations. Although CO emissions from motor vehicles have decreased through emission control technologies andregulations in many countries, motor vehicles remain the primary source of this pollutant at most locations. All motor vehicles emit CO, but the large percentage of CO released into the atmosphere from this source comes from light duty, gasoline powered vehicles.

**2. Particulate matter:**

PM10 particles generally pass through the nose into the lungs. Once inhaled, these particles can affect the health and lungs and pose a significant threat to health.PM2.5 consists of particles less than onete nth the diameter of human hair and is responsible for a serious threat to human health. Particles less th an 2.5 microns in diameter are referred to as 'fine particle,' that are so small

**3. Oxides of nitrogen NOx**:

This causes photochemical smog, acid rain, and ozone destruction. When inhaled by humans, alveolar structures and their function in the lungs are interrupted, posing a serious threat to public health. Gas irritates the lung which has been shown to reduce the efficacy of the immune systemNOx causes serio us respiratory problems.When combined with water; it forms nitric acid and other toxic. NO2 is a main component in the formation of ozone at ground level.

**4. Sulfur dioxide:**

Gas irritates the respiratory system and eyes and is responsible for longterm heart disease, other cardiovascular diseaseand bronchitis. It also causes shortness of breath and coughing for asthma suffe rers. Sensitive vegetation is severely damaged by SO2 and is also a major contributor to acid rain, whi ch damages the environment and disrupts the ecosystem.

**5. Lead:**

Lead causes gastrointestinal symptoms, severe brain and kidney damage, and cancer. Lead may not exceed total suspended particles. Pb is no longer added to petrol in many countries, motor vehicle fuels still contain trace amounts of Pb from crude oil.

**6. Ozone:**

Breathing ozone causes chest pain, coughing, irritation of the throat, and inflammation of the respiratory tract.It can also reduce the function of the lung and serious harm the lung tissue. Ozone is not directly emitted from motor vehicles, and O3 measurements are not typically collected for near-road applications.

**7. Carbon dioxide:**

Exposure of humans to carbon dioxide concentrations ranging from 17% to 30% quickly leads touncon sciousness, coma, convulsions, and death. Carbon dioxide, methane and gas molecules that have similar structures may influence the global climate by internal molecular vibration and rotation, whichcauses these molecules to absorb infrared radiation.When these gases are part of the atmosphere, they absorb some of the heat that the Earthnormally radiatesinto space. Carbon Dioxide is "greenhouse gas" atmospheric.

**8. Volatile Organic Compounds**:

It causes acute symptoms such as nose, throat, and eye irritation, causes headaches, nausea, dizziness, allergic skin reactions, and can also damage internal organs such as the liver and kidneys. In addition, certain compounds of VOCs may not cause immediate risks but may lead to chronic health risks.VOC s are essentially fuel that has been unburned during the combustion process or has escaped through fu el evaporation into the atmosphere. VOCs can often be divided into separate categories of methane (C H4) and non-methane (NMVOC).Stationary sources of hydrocarbons include petrochemical production, oil refining, incompleteincineration, paint manufacturing and use, and dry cleaning. They can also induce hematological (blood-related) problems. [1]

## III. SOURCE OF VEHICULAR POPULATION.

**1. Emissions of Green House Gases (GHGs) from**

**Transport Sector:**The CO2 emission study carried out by the Center forScience and Environment based in Delhi showed that CO2 emissions on Indian roads are expected to reach a value of 1212 million tonnes in 2035 from a value of 208 million tonnes in 2005. Total emissions of CO2 from well to exhaust in Indian roads from 2005 to 2035 are shown below,Source: CSE, New Delhi

**2. Vehicular Population Growth:** The transport demand in India has been growing rapidly. Sustained economic growth, improved road infrastructure and increased disposable income of households have led to the rising demand for road transport. The number of registered motor vehicles In India has been steadily increasing since1951 the total number of registered motor vehicles increased from about 0.3 million in March 1951 to 230.03 million, up from 5 million in March 1951.

**IV. LITERATURE REVIEW:**

Some of the major steps taken by the Union Government to check vehicular pollution include:

1. Mass Emission Standards (Bharat Stage IV) implemented across the country for all categories of new vehicles from 01 April, 2017. India will leap frog from BS-IV norms to BS-VI and Notification for implementation of BS-VI emission norms for all categories of new vehicles from 01 April, 2020 has been issued.

2. Fuel efficiency norms for passenger cars have been notified on 23 April, 2015. Promotion of electric/hybrid vehicles through National Electric Mobility Mission Plan 2020 and Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles.

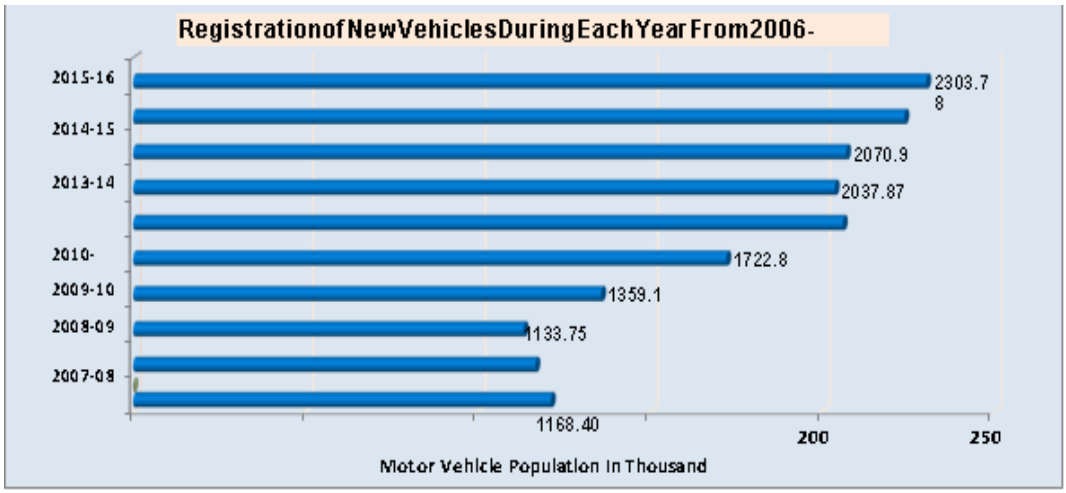
3. Introduction of cleaner / alternate fuels such as LPG, CNG, Bio-Diesel Blends, Battery Operated, Hydrogen and Solar Operated vehicles.

4. Promotion of public transport and network of metro, e-rickshaws, promotion of car pooling, Pollution under control Certificate, lane discipline, vehicle maintenance, etc. **[2]**

The report shows that deadly air pollution is a national problem that kills 1.2 million Indians every year, costing the economy an estimated 3 % of GDP. If the development of the country is important, the fight against air pollution must be a priority. Data collected by Greenpeace India from state pollution control boards show that there are virtually no sites in India that comply withWHO and National Ambient Air Quality (NAAQ) standards and most cities are critically polluted.Except for a few places in Southern India that have complied with NAAQ standards, the entire country is experiencing a public health crisis due to high levels of air pollution. A number of ministries in the states and central governments, industry and the general public need urgent and determined action, given the range of sectors responsible for emissions of pollutants. [3].

Air pollution is a major problem internationally, with China and India making headlines most frequently due to heavy smog. In 2013, polluted air contributed for 5.5 million premature deaths, with China and India accounting for 1.6 million and 1.4 million respectively.However, on a per capita basis, some European countries match those Asian countries in terms of death. According to the OECD report, China had 953.7 deaths per million inhabitants in 2013, while it had a hungry head of 937.6. Air pollution is the fourthhighest risk factor for death worldwide, contributing to heart disease, stroke, lung cancer, bronchitis and other conditions. [4]

Yearly Registration of Vehicles: Total number of vehicles in the Maharashtra State registered during the year 2015-16 is 23,03,783 having increased from 12,13,043 as in the year 2006-07. Thus, percentage increase in a decade is 89.91 % .Year wise registration of vehicles during the period 2006-07 to 2015-16 is shown in chart No. 1.




The Global trend indicates the shadow of things to come. The demand for restraints on personal vehicle-based mobility will get even sharper, as clean air and climate change policies begin to get more aggressive with time. The World Health Organization (WHO) also considered traffic related deaths and injuries as a major public health challenges, as they added to the disability burden of the country. This means measures should be put in place to change urban design to make cities safer walk able and public transport friendly. [5]

In India Air pollution monitoring program currently tests for only five parameters on national level; i.e.Oxides of Sulphur, Oxides of Nitrogen, Suspended Particulate Matter, Respirable Particulate Matter and Carbon Monoxide.But unfortunately we all are unaware of the new air toxins in the air, which is already claiming our lives. Over the years,vehicleemission standards have been tightened. India also has environmental air quality standards for conventional pollutants emitted from vehicles.However; there is no regulation for mobile air toxins. Nor are there any standards or strategies in place to control them. Delhi is an exception where benzene, toluene, xylene, benzene soluble organic fraction and PAHS are measured, but notas regularly as conventional pollutants. [6]

Urban growth focused on vehicles is not inevitable, it is reversible. If Indian cities think that managing urban mobility to reduce dependency on cars is idealism, then they should think again. It is hard reality that other countries have taken cognizance of. Across the word, rich cities have started to take action to reverse the trends in travel choices. Many cities are reclaiming space from cars to make pedestrian and public spaces safer. Several cities in Europe and U.S. now limit the number of parking spaces, and charge them high to restrain parking demand and vehicle uses. In Singapore cars have to pay for entering core commercial areas. People have to buy bids to buy cars, making the total cost of cars prohibitive. [7]

We live in an atmosphere full of carcinogenic toxins, along with our serious illnesses. The magnitude of new air toxic emissions from vehicles is alarming. They are of greater concern because they are undermonitored. A recent study by the Chennaibased NGO Community Environmental monitoring,

'Smoke Screen ambient air quality in India,' reported that the air toxicity variety in ambient air exceeded USEPA on average.We generally link conventional pollutants such as nitrogen, SPM, hydrocarbons Oxides andCarbon monoxide to vehicles. However, BTEX compounds, Polycyclic Aromatic Hydrocarbons (PAHs) and formaldehyde are among the other pollutants that also originate from vehicles and are classified as mobile air pollutants by the USEPA. They are emitted from a variety of sources,but with an everincreasing number of vehicles on the road, such toxic substances need to be increasingly monitored. [8]

Twostroke motor vehicles are a major part of the fleet of motor vehicles in Asian countries.These vehicles account for about 60% of the fleet of motor vehicles and contribute significantly to air pollution, resulting in adverse health effects, especially for urban dwellers. They are a major contributor to particulate matter (PM) and hydrocarbon emissions, in addition to visiblesmoke.PM emissions from a conventional two-stroke engine used in South Asia are higher in order ofmagnitude compared to a four-stroke engine of equivalent capacity. Poor maintenance ofengines,misuse of lubricants and adulteration of fuel are exacerbating pollution from these engines. Emissions from current 2stroke gasoline engines can be minimized by using the correct form and quantity oflubricant, improving vehicle maintenance and improving gasoline efficiency.PM emissions from a conventional 2stroke engine used in South Asia are higher in order of magnitude compared to a 4stroke engine of equivalent capacity. Poor maintenance of engines, misuse of lubricants and adulteration of fuel are exacerbating pollution from these engines.Emissions from current 2-stroke gasoline engines can be minimized by using the correct form and quantity of lubricant, improving vehicle maintenance and improving gasoline efficiency.Other technological choices include replacing the 2-stroke engine with a 4-stroke gasoline engine and transitioning to cleaner alternative fuels such as liquefied petroleum gas, compressed natural gas and electricity. [9]

**V. CONCLUSION:**

Various studies have indicated that vehicle emissions are a mixture of various pollutants that have adverse health effects, including the mutagenesis of cardiovascular mortality,carcinogenicity and deterioration of the health of vulnerable people, such as people with impaired health conditions such as asthmatics, children and the elderly.Acute exposures have resulted in hospitalization due to respiratory problems, while health consequences such as mutagenicity of cardiovascular health, carcinogenicity and diseases have contributed to chronic exposures.In India, vehicular air pollution monitoring by CPCB is currently measuring just five criteria at national level, but sadly we are all unaware of the fresh air toxin. It is therefore recommended that successful vehicle emission control strategies be developed and implemented.Insufficient and low quality of road pavements contributes to increased costs for the maintenance of cars, thus rising emissions. It has been projected that road

development would result in savings of about 15% of vehicle running costs. The vehicle maintenance and inspection programme should be established to ensure the reliability of vehicle emission control systems. Proper maintenance, testing, clean vehicle, use of clean fuel are the means to minimize pollution. The need for an integrated systemic approach to vehicle emissions management cannot be overemphasized. In addition, the car and oil industries need to come together to meet the air quality goals in order to meet changing fuel quality requirements and vehicle technology.

Table No.1 Summary of the study

| Published Papers, Reports, and Study with Year | Variable | Findings |
|---|---|---|
| Journal of Clean Energy Technologies, Nov. 2018, "Effects of Vehicular Emissions on Human Health | Effects of Vehicular Emissions | The adverse health and environmental consequences |
| Reference Note No. 14/RN./Ref./June/2018, Lok Sabha Secretariat, New Delhi | Specification for Vehicular emission | Implementation of Norms to control vehicular emission. |
| Dahiya, Sunil, Lauri Myllyvirta, &Nandikesh S. Airpocalypse: Assessment of Air Pollution in Indian Cities. 2017 | National Ambient Air Quality | Urgent and determined action is needed |
| McCarthy, N., 'Europe Matches Asian Joints in Air Pollution Deaths' Statist May 9, 2016. | Risk factor for death | The fourth-highest risk factor for death is Air pollution |
| Hidalgo D. Bhatt A. 'Don't miss the bus, Delhi, The Hindu Business Line, August 07, 2015 | National Urban Transport Policy (NUTP | Cities should plan for people, not vehicles. |
| Shah Chirag 'Hazardous Mobile Air Toxins in the Air', July 2015 | Ambient Air Quality Standards | Only five parameters monitored for vehicular air pollution in India |
| PARIVESH- Hazardous air pollutants - publication by, CPCB, MoEF, Government of India, 2009 | the total air pollution load in many urban areas | Vehicular emissions impact on the general pollution |
| 'Smoke Screen-Ambient Air Quality inIndia' Community Environmental Monitoring June2006, | Variety of sources, Mobile source air toxics Conventional pollutants. | Other pollutants that also emanate from vehicles. |
| PARIVESH, Transport Fuel Adulteration, CPCB, India Newsletter (2003). | Public Health Damage to vehicles Adulteration of fuel | fuel Adulteration causesair pollution, damage to engines, and loss of public health |

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