



TRANSPORT EXHAUST GASES PRODUCED AT TRAFFIC LIGHTS AS A FACTOR OF ATMOSPHERIC POLLUTION AND THEIR MEDICAL CONSEQUENCES

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Abstract: The main ideas addressed in this article focus on how harmful gases emitted from automobiles - which we use daily to meet our essential needs - can lead to serious pathological conditions in the human body. It is well known that in cities, traffic congestion primarily occurs near traffic lights, and it can be confidently stated that in those very areas, air pollution levels are significantly higher compared to other locations. In the following sections, we will examine these situations one by one and attempt to explore the topic of the article in detail.

Keywords: Engine, Alzheimer's disease, Dementia, WHO, Urbanization, Atherosclerosis, Ischemic heart disease, PM2.5, PM10, GDP, Electric transport, Hybrid vehicles.

Nowadays, environmental problems and their impact on human health remain one of the most pressing issues on a global scale. One of the factors that has the greatest impact on air pollution in urban environments is exhaust gases emitted by vehicles. In particular, as a result of frequent stopping and starting of vehicles at traffic lights, exhaust gases are released into the air in large quantities and accumulate in one place. This has a significant negative impact on both the ecological environment and public health. Carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur compounds (SO_x), hydrocarbons and other harmful substances emitted from vehicle engines not only pollute the atmosphere, but also pose a direct threat to the human body. As a result of the high concentration of these gases around traffic lights, the risk of developing diseases such as respiratory diseases, cardiovascular diseases, allergic reactions, chronic bronchitis and asthma increases. This type of air pollution is also an important factor in the development of serious diseases such as pulmonary obstruction, atherosclerosis, and even neurodegenerative diseases such as Alzheimer's and dementia. According to the World Health Organization (WHO), air pollution caused by transport emissions causes millions of premature deaths every year. This problem is becoming more urgent, especially in large cities where urbanization is rapidly taking place, as a result of traffic jams at traffic lights. Therefore, studying the impact of exhaust gases emitted by vehicles at traffic lights on atmospheric air and human health is one of the most important areas of scientific research today. In recent years, many scientific studies have been conducted worldwide on the impact of exhaust gases emitted by vehicles on atmospheric air and human health. Studies show that the main source of air pollution in urban environments is internal combustion engines. Their exhaust gases contain carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur compounds (SO₂), formaldehyde, and other toxic substances, which cause significant damage to both the environment and the human body [1; 2].



According to a 2021 report by the World Health Organization (WHO), harmful emissions from transport are responsible for more than 4.2 million premature deaths worldwide [3]. Especially in large cities and congested areas, especially in traffic jams, the concentration of exhaust gases increases sharply and air quality deteriorates. In such a situation, people inhale high amounts of these gases, which causes serious health problems [4].

Uzbek scientists have also conducted a number of scientific studies on the relationship between air pollution and human health. For example, A.Kh. Jalilov (2018) notes in his study that in areas with dense traffic flow in Tashkent, the amount of harmful substances in the air is several times higher than the normative indicators [5]. Also, the scientific work of our environmental scientists shows that gases accumulated in traffic light areas play an important role as an aggravating factor in respiratory diseases [6]. Studies conducted in the European Union countries have shown that air pollution associated with vehicle emissions at traffic lights is a significant factor in the



development of cardiovascular diseases, in particular atherosclerosis and ischemic heart disease [7]. Scientists from the United States and Japan have proven that the incidence of respiratory diseases such as bronchitis and asthma is higher in people living in traffic jam areas than in other areas [8; 9]. Literature analysis shows that exhaust gases emitted by vehicles, especially when they accumulate at traffic lights, pose a serious threat not only to the environment, but also to human

health. This issue requires in-depth scientific study not only on a global scale, but also in the conditions of Uzbekistan.

During the operation of internal combustion engines of vehicles, various harmful gases are released into the atmosphere. Mainly, gasoline engines emit carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxides (NO, NO₂), hydrocarbons (C_nH_m) and sulfur compounds. Diesel engines produce high amounts of nitrogen oxides and fine particles (PM_{2.5}, PM₁₀). Stopping, starting and accelerating vehicles at traffic lights leads to the accumulation of exhaust gases in one area. Especially in areas with poor ventilation, these gases remain in the air for a long time and enter the body through the respiratory tract of the population. Transport exhaust gases have a complex chemical composition and cause varying degrees of harm to human health:

Carbon monoxide (CO): combines with hemoglobin, restricts oxygen transport and creates a state of hypoxia.

Nitrogen oxides (NO_x): damage the mucous membrane of the respiratory tract, leading to the development of bronchial asthma and chronic bronchitis.

Sulfur dioxide (SO₂): increases the inflammatory process in the respiratory tract, negatively affects the functioning of the cardiovascular system.

Fine particles (PM_{2.5} and PM₁₀): can penetrate the alveoli and cause chronic inflammation and tumors in lung tissue.



Hydrocarbons and formaldehyde: have a mutagenic and carcinogenic effect, increasing the risk of cancer.



The accumulation of gases generated in front of traffic lights can have the following serious consequences for human health:

Effects on the respiratory system: bronchitis, asthma, obstructive pulmonary disease, lung cancer.

Effects on the cardiovascular system: atherosclerosis, ischemic heart disease, hypertension and stroke.

Effects on the central nervous system: high concentrations of carbon monoxide can cause

headaches, fatigue, and decreased attention, and long-term exposure can increase the risk of Alzheimer's and dementia.

Effects on the immune system: weakens the body's defenses and increases susceptibility to infectious diseases.

Increased traffic emissions at traffic lights not only cause individual health problems, but also wider social and environmental problems. By worsening urban air quality, it reduces overall life expectancy, increases the burden on the health system, and causes economic damage. According to the World Bank, air pollution in some countries leads to economic losses of up to 5–7 percent of gross domestic product (GDP).

Scientific sources recommend a number of measures to reduce this problem:

Regulate traffic flow: reduce waiting times at traffic lights, introduce smart traffic light systems.

Switch to environmentally friendly transport: widespread use of electric vehicles, hybrid cars, and public transport.

Improve urban planning: create comfortable conditions for pedestrians and cyclists, increase green areas.

Strengthen legislation: set strict standards for the amount of exhaust gases and strengthen environmental control.

Based on the above scientific research, literature analysis, and available scientific sources, we can say that:

1. Exhaust gases emitted by vehicles in front of traffic lights accumulate in high concentrations in the atmosphere and pose a serious threat to human health.

2. The carbon monoxide, nitrogen oxides, sulfur compounds, hydrocarbons, and fine particles (PM_{2.5}, PM₁₀) contained in these gases have a negative impact on the respiratory, cardiovascular, nervous, and immune systems of the body.

3. According to WHO and other international organizations, transport emissions are one of the leading factors of global health problems, causing premature deaths of millions of people every year.

4. In Uzbekistan, it is observed that in areas with dense traffic flow, especially around traffic lights, harmful substances in the air are several times higher than the regulatory standards.

Having studied the current development and the need for transportation, we can say that any situation has its advantages and disadvantages. The main focus of the article was to highlight the pathological conditions observed in the population, which consume air containing harmful gases,



as a result of the accumulation of cars at traffic lights. Based on general ideas and considerations, we present our proposals as follows:

1. Introduction of ecological vehicles - development of electric cars, hybrid vehicles and creation of conditions for their widespread use.
2. Application of smart traffic light systems - reduction of exhaust gases by reducing traffic congestion and balancing the flow of traffic.
3. Expansion of green areas - ensuring natural air filtration by increasing trees, green spaces and landscape elements around traffic lights.
4. Public awareness and advocacy - to widely explain to car owners the need to comply with environmental safety rules and regularly undergo technical inspections of vehicles.
5. Strengthening the regulatory framework - to strengthen legislative measures aimed at sharply reducing the amount of exhaust gases emitted by vehicles.

The conducted scientific analysis and literature review showed that exhaust gases emitted by vehicles are one of the main sources of urban air pollution. In particular, the amount of emissions increases sharply during the process of stopping and starting cars at traffic lights. The accumulation of harmful gases in such areas leads to a decrease in air quality, posing a serious threat not only to the ecological environment, but also to human health. Studies have shown that high levels of carbon monoxide, nitrogen oxides, sulfur compounds, hydrocarbons, and fine particles (PM_{2.5}, PM₁₀) accumulated in traffic light areas have a negative impact on the body, contributing to the development of bronchitis, asthma, cardiovascular diseases, hypertension, stroke, and even neurodegenerative diseases (Alzheimer's, dementia). Also, statistics from the WHO and other international organizations confirm that air pollution caused by transport emissions reduces human life expectancy and is one of the global health problems. This problem is also relevant in the conditions of Uzbekistan. In large cities, especially in Tashkent, a sharp increase in traffic flow, traffic jams, and the concentration of exhaust gases generated in front of traffic lights have been found to be higher than the regulatory standards. This directly threatens the health of the population. Therefore, it is necessary to conduct a thorough scientific study of the impact of exhaust gases emitted by vehicles at traffic lights on atmospheric air and human health, and to develop comprehensive measures to prevent existing environmental and medical problems. The results of this study may serve to optimize the urban transport system in the future, ensure environmental safety, and improve the quality of life of the population.

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