THE RELATIONSHIP BETWEEN AIR POLLUTION AND ARTERIAL HYPERTENSION

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Nowadays, environmental pollution, especially air quality issues, is one of the most pressing global public health concerns. According to the World Health Organization (WHO), 99% of the world's population lives in polluted air conditions. The presence of harmful substances in the air, particularly nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM2.5, PM10), and ozone (O_3), increases the risk of cardiovascular diseases, including arterial hypertension.

Arterial hypertension is one of the most widespread diseases in the world, affecting one in three adults. According to WHO data, 1.28 billion people globally suffer from arterial hypertension, with 700 million lacking access to essential medical services for treatment.

Air pollution is one of the primary environmental factors leading to arterial hypertension, directly affecting heart and vascular function. This article scientifically discusses the link between air pollution and arterial hypertension, analyzes epidemiological research findings, and highlights public health measures.

Main Section: Air Pollution and Its Impact on the Human Body

Air pollution enters the body through various pathways, severely affecting the cardiovascular system. Harmful substances in the atmosphere enter the lungs via inhalation, then reach the circulatory system, causing inflammation of blood vessels, damage to the endothelium, and an increase in blood pressure.

The main air pollutants and their effects on the cardiovascular system are as follows:

- Nitrogen dioxide (NO_2) – damages vascular endothelium, affects blood circulation, and increases blood pressure.
- Particulate matter (PM2.5, PM10) – fine particles enter the bloodstream, causing vascular constriction and increasing the risk of hypertension.
- Carbon monoxide (CO) – binds to hemoglobin, reducing oxygen delivery to tissues, thereby impairing heart and blood vessel function.
- Ozone (O_3) – causes inflammation in the respiratory tract, accelerates heart rate, and raises blood pressure.

Long-term exposure to these pollutants significantly increases the risk of hypertension, stroke, and ischemic heart disease.

The Link Between Air Pollution and Arterial Hypertension

Numerous epidemiological studies confirm the relationship between air pollution and the development of arterial hypertension. Some key studies include:

- A 2017 study in China involving over 1 million participants found that an increase of 10 μg/m³ in PM2.5 concentration was associated with an average increase of 1.5 mmHg in blood pressure.
- A 2021 European study found that people living in cities with high pollution levels had a 20-25% higher risk of developing hypertension.
- According to the U.S. National Institutes of Health, a 15-year observational study revealed that high concentrations of PM2.5 and NO_2 increased the risk of arterial hypertension by up to 30%.
- According to the Ministry of Health of Uzbekistan, in Tashkent, the number of hypertension patients has increased by 40% over the past 10 years in areas with high air pollution.

How Does Air Pollution Contribute to Hypertension?

- Endothelial dysfunction – loss of vascular elasticity and acceleration of narrowing processes.
- Increased oxidative stress – impairment of the body's protective systems, leading to elevated blood pressure.
- Chronic inflammation – triggers immune responses that weaken the cardiovascular system.

Environmental Situation and Hypertension Statistics in Tashkent

Tashkent has a high level of air pollution, contributing to the increased incidence of cardiovascular diseases, especially arterial hypertension. According to the Ministry of Health of Uzbekistan:

- The levels of nitrogen dioxide and particulate matter (PM2.5, PM10) in Tashkent exceed international standards by 2-3 times.
- Over the past five years, the number of hypertension patients has increased by 40%.

Measures to Reduce Pollution-Related Hypertension

- Personal protection: Wearing masks, living in environmentally clean areas, and limiting outdoor exposure in polluted conditions.
- Improving the environment: Expanding green spaces and reducing industrial emissions.
- Medical prevention: Regular blood pressure monitoring, healthy nutrition, and increased physical activity.

Conclusion

Air pollution significantly contributes to the development of arterial hypertension. Tashkent also faces high levels of environmental pollution, leading to an increase in cardiovascular diseases. In the future, mitigating hypertension risks is possible through environmental protection, implementing ecological measures, and improving public health programs.

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