الكلية	
القسم	
المادة باللغة الانجليزية	Air pollution
المادة باللغة العربية	تلوث الهواء
المرحلة الدراسية	
اسم التدريسي	م.م اسماء ماجد حامد
عنوان المحاضرة باللغة الانجليزية	The impact of air pollution on public health
عنوان المحاضرة باللغة العربية	تاثير التلوث الجوي على الصحة العامة
رقم المحاضرة	6
المصادر والمراجع	Seinfeld, J. H., & Pandis, S. N. (2016). Atmospheric Chemistry and Physics: From Air Pollution to Climate Change. 3rd .Edition. Wiley
	Manisalidis, I., Stavropoulou, E., Stavropoulos, A., & Bezirtzoglou, E. (2020). Environmental and health impacts of .air pollution: A review. Frontiers in Public Health, 8, 14
	World Health Organization (WHO). (2021). WHO global air quality guidelines: Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide

The impact of air pollution on public health

Air pollution is one of the most serious environmental threats to human health worldwide. According to the World Health Organization (WHO), millions of premature deaths each year are directly linked to poor air quality. Pollutants in the air can penetrate deep into the human body, affecting not only the respiratory system but also the cardiovascular, nervous, and even reproductive systems. The health effects of air pollution depend on the type, concentration, and duration of exposure to pollutants. Vulnerable groups, such as children, the elderly, and individuals with pre-existing conditions, are at particularly high risk.

1. Respiratory System Effects

The respiratory system is the primary target of air pollution because inhaled pollutants first enter through the lungs.

• Short-term effects: Exposure to high concentrations of pollutants like ozone, nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) causes irritation of the nose, throat, and lungs. This leads to coughing, wheezing, shortness of breath, and chest tightness.

• Asthma and bronchitis: Air pollution aggravates asthma attacks and increases the incidence of chronic bronchitis. Children growing up in polluted environments are more likely to develop asthma.

• Chronic Obstructive Pulmonary Disease (COPD): Long-term exposure to particulate matter (PM2.5 and PM10) significantly contributes to COPD, reducing lung function and increasing hospital admissions.

• Lung cancer: Fine particles and toxic compounds such as benzene, polycyclic aromatic hydrocarbons (PAHs), and heavy metals are carcinogenic and increase the risk of lung cancer.

Inhaled particles smaller than 2.5 micrometers (PM2.5) are particularly dangerous because they can reach the deepest parts of the lungs and cross into the bloodstream.

2. Cardiovascular System Effects

Air pollution is now recognized as a major contributor to cardiovascular disease. Pollutants such as particulate matter, carbon monoxide, and nitrogen oxides affect blood circulation and heart health.

• Hypertension: Long-term exposure to air pollution is associated with increased blood pressure.

• Heart attacks and strokes: Fine particles trigger inflammation, oxidative stress, and blood clot formation, leading to a higher risk of myocardial infarction and ischemic strokes.

• Arrhythmias: Pollutants disturb the normal electrical activity of the heart, causing irregular heartbeats.

• Atherosclerosis: Continuous exposure accelerates the buildup of plaques in blood vessels, narrowing arteries and reducing blood flow.

Studies have shown that living in areas with heavy traffic or industrial activity significantly increases the likelihood of cardiovascular events and premature death.

3. Effects on the Nervous System

Recent scientific research has revealed that air pollution also affects the central nervous system (CNS).

• Cognitive decline: Long-term exposure to PM2.5 and nitrogen dioxide has been linked to reduced cognitive performance and increased risk of dementia, including Alzheimer's disease.

• Neurodevelopmental disorders: Children exposed to polluted air during pregnancy and early childhood may suffer from impaired brain development, lower IQ, and attention deficit hyperactivity disorder (ADHD).

• Mental health: Exposure to polluted environments is associated with higher rates of depression, anxiety, and other mood disorders, possibly due to chronic inflammation and oxidative stress in the brain.

These findings demonstrate that air pollution has far-reaching consequences beyond the lungs and heart.

4. Reproductive and Developmental Effects

Air pollutants also impact reproductive health and fetal development.

• Pregnancy complications: Exposure to high levels of carbon monoxide, nitrogen oxides, and particulate matter increases the risk of premature birth, low birth weight, and stillbirth.

• Fertility issues: Heavy metals and toxic chemicals in polluted air may impair fertility in both men and women by affecting sperm quality and hormone balance.

• Child development: Infants born to mothers exposed to high pollution levels may face long-term developmental problems, including respiratory diseases and impaired neurological growth.

This shows that air pollution does not only affect individuals directly but can also impact future generations.

5. Immune System and General Health

Air pollutants weaken the immune system, making people more vulnerable to infections.

• Reduced immune response: Fine particulate matter disrupts the function of white blood cells, reducing the body's ability to fight off pathogens.

• Increased infections: People living in polluted areas experience higher rates of pneumonia, influenza, and other respiratory infections.

• Chronic inflammation: Continuous exposure to pollutants maintains a state of low-grade inflammation throughout the body, which is a risk factor for many chronic diseases, including diabetes and cancer.

The weakening of immune defenses means that even mild exposure to viruses and bacteria becomes more dangerous in polluted regions.

6. Vulnerable Populations

Not everyone is equally affected by air pollution. Certain groups face higher risks:

• Children: Their lungs are still developing, and they breathe more air relative to their body weight.

• Elderly people: Pre-existing conditions make them more susceptible to pollution-related illnesses.

• Patients with chronic diseases: Those with asthma, COPD, diabetes, or heart disease are more vulnerable to worsening symptoms.

• Low-income communities: Often live closer to highways, factories, or waste sites, experiencing higher exposure levels.

This highlights the social and environmental justice dimension of air pollution.