

Air Pollution and Health in Turkey

Facts, Figures and Recommendations



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Turkish Medical Association



Turkish Society of Public Health Specialists



Turkish Thoracic Society



Turkish Respiratory Society

Türkiye
Solunum
Araştırmaları
Derneği



Turkish Occupational Medicine Society

Air pollution is an important risk factor for health in Europe and worldwide. A recent review of the global burden of disease showed that it is one of the top ten risk factors for health globally¹. Worldwide an estimated 7 million people died prematurely because of pollution; in the European Union (EU) 400,000 people suffer a premature death². The Organisation for Economic Cooperation and Development (OECD) predicts that in 2050 outdoor air pollution will be the top cause of environmentally related deaths worldwide³. In addition, air pollution has also been classified as the leading environmental cause of cancer⁴.

Impacts of air pollution in Turkey

It is still difficult to gather adequate and verified data on air pollution in Turkey. From the evidence available, Turkey emerges as a country with one of the highest rates of premature deaths due to air pollution in Europe. According to recent estimates⁵, in 2010, 28,924 people in Turkey died prematurely from ambient PM and ozone exposure.

WHY IS AIR POLLUTION A CONCERN FOR HEALTH?

Exposure to outdoor air pollution is associated with a broad spectrum of acute and chronic health effects ranging from irritant effects to death⁶. While the impacts on respiratory and cardiovascular disease are well documented, new science also shows air pollution as an emerging risk factor for children's health and even diabetes⁷. Sensitive and vulnerable groups such as pregnant women, children, the elderly and those already suffering from respiratory and other serious illnesses or from low income groups are particularly affected.

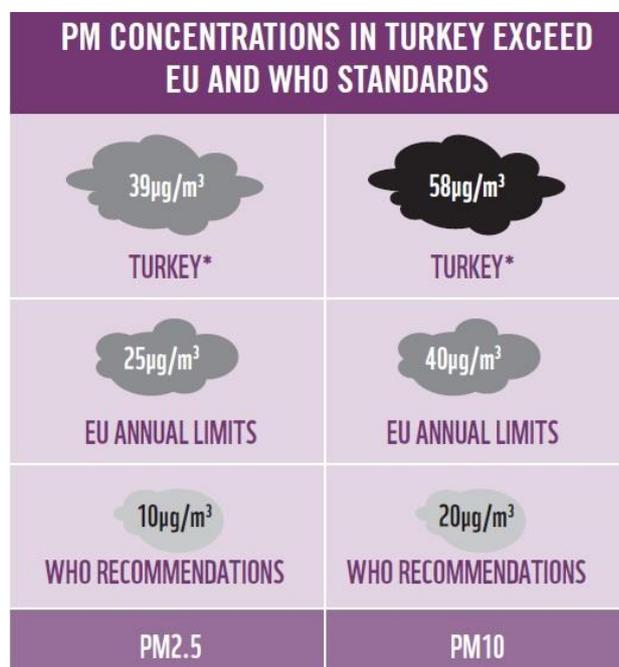
The health effects of air pollution are well documented, even though the pollution mixtures in the air can be complex. Air pollution exists as a mixture of liquid and solid phases; a mixture of gaseous, volatile, semi-volatile and particulate matter, and its exact composition varies widely. The main pollutants for which numerous studies on health effects exist are particulate matter, ozone, nitrogen dioxide, sulphur dioxide, methane, mercury and black carbon.

AIR POLLUTION IN TURKEY

Air quality in Turkey is a big concern: measurements show that citizens all over the country breathe in air that is considered harmful to health. The air quality standard for PM2.5 and concentrations of PM10 are much higher than what the EU and the World Health Organization (WHO) have set to protect health.

According to the European Environment Agency (EEA), 97.2 percent of the urban population in Turkey is exposed to unhealthy levels of particulate matter (PM10)⁷.

Ankara has PM yearly average concentrations of 58 $\mu\text{g}/\text{m}^3$, and Istanbul 48 $\mu\text{g}/\text{m}^3$. According to the Turkish Ministry of Environment and Urbanization, the cities with the most polluted air are Iğdır, Batman and Afyon⁸.



* Turkey annual mean amounts for 2011. Taken from Ambient Air Pollution Database, WHO, May 2014, measurements reported by Airbase for Europe.

IMPACTS OF AIR POLLUTANTS ON HEALTH

RESPIRATORY SYSTEM

Effects include: increased respiratory symptoms, infections; increased airway reactivity, irritation; lung inflammation; increased respiratory mortality and hospital visits, hospitalisation; decreased lung function, asthma exacerbations, exacerbation of chronic obstructive pulmonary disease (COPD), and increased lung cancer risk.

The US American Thoracic Society identified a broad range of respiratory health effects associated with air pollution that should be considered “adverse”, spanning outcomes from death from respiratory diseases to reduced quality of life, and including some irreversible changes in physiologic function⁹.

Studies show that lung function growth in children is reduced in areas with high PM concentrations¹⁰; and this function either improves when children are relocated to areas with lower air pollution, or deteriorates when children move to areas with greater air pollution¹¹. This effect on lung development is an additional risk factor for developing lung diseases later in life.

Air pollution exposure can trigger new cases of asthma, worsen a previously-existing respiratory illness, and provoke development or progression of chronic illnesses including COPD, emphysema and lung cancer.

COPD is a life-threatening lung disease that interferes with normal breathing. The number of deaths from COPD has increased more than 60% over the last 20 years, and air pollution is an important risk factor through inflammation, an immunological response. The inflammatory response is referred to as chronic bronchitis. In the air cells it leads to destruction of tissue, or emphysema.

CARDIOVASCULAR SYSTEM

Effects include: altered cardiac autonomic function, myocardial infarction, angina pectoris, increased blood pressure, arteriosclerosis, hypertension, and increased cerebrovascular ischemia.

In recent years, a large body of scientific evidence has emerged that has strengthened the link between exposure to different air pollutants and cardiovascular effects, for acute and/or chronic effects¹².

The biological mechanisms linking air pollution to heart disease involve direct effects of pollutants on the cardiovascular system, blood, and lung receptors, but also indirect effects mediated through pulmonary oxidative stress and inflammatory responses.

Direct effects may occur via agents that readily cross the pulmonary epithelium into the circulation, such as gases, and possibly ultrafine particulate matter along with soluble constituents of PM2.5 (e.g. transition metals). These direct effects of air pollution represent a plausible explanation for the occurrence of rapid cardiovascular responses (within a few hours), such as increased myocardial infarctions. Less acute and chronic indirect effects (from several hours to days) may occur via pulmonary oxidative stress/inflammation induced by inhaled pollutants.

Peaks in the concentration of other air pollutants – especially the combination of fine particulate matter and nitrogen oxides – correlate with increased hospital admissions for potentially fatal disturbances of heart rhythm. Most often those hospital admissions are due to ischemic heart diseases; and congestive heart failure.

NERVOUS AND CEREBROVASCULAR SYSTEM

Effects include: neurodevelopmental disorders, neuro-inflammation, oxidative stress, alterations in the blood-brain barrier, headaches, anxiety, strokes, Alzheimer's disease, and Parkinson's disease.

The mixture of components of air pollution also includes heavy metals that are emitted into the atmosphere, for example mercury or lead. They remain in the air until they are transmitted back to the earth by rain. Many of heavy metals are particularly neurotoxic to the human body, especially to children.

Lead exposure in childhood can result in decreased cognitive functioning, including assessments of reaction time, scanning and executive functioning in adults, that is, cognitive flexibility and abstract reasoning. Lead exposure can also affect subsequent verbal memory and verbal fluency. Aggression, behavioural issues (such as depression and sleep complaints) and increased anti-social and delinquent behaviour have also been positively correlated with lead exposure.

Mercury is a potent neurotoxin that can severely harm the brain and the developing nervous system. Exposure to methyl mercury in the womb can adversely affect the developing brain and nervous system of a baby, resulting in eventual impacts on cognitive thinking, memory, attention, language, and fine motor and visual spatial skills.

REPRODUCTIVE CAPACITIES AND CHILDREN'S HEALTH

Effects include: compromised sperm quality, DNA fragmentation, low birth weight, preterm birth, and small gestational age births.

In developing embryos, the placenta serves as a barrier against many environmentally hazardous substances, but it might not be protective against all components of air pollution. Children, even before birth, are particularly susceptible to air pollutants. Increasing evidence shows how early-life exposure to air pollutants is contributing to higher risks of developing chronic diseases later in life, including obesity, diabetes, and hormone related cancers such as breast and prostate cancer. Furthermore, recent studies found associations between exposure to outdoor air pollution during pregnancy and lower birth weight, as well as higher rates of preterm birth and pre-eclampsia. It has been shown that there is an association between exposure to PM2.5 and birth outcomes, including low birth weight, preterm birth and small for gestational age births.

WHY IS THE ENERGY SECTOR RELEVANT FOR AIR POLLUTION IN TURKEY?

In every country, the energy sector is an important source of air pollution. An analysis of the EEA shows that energy use and supply is responsible for 48% of NO_x emissions, 35% of non-methane VOCs and 99% of sulphur dioxide (SO₂) emissions⁷. These pollutants can contribute to the formation of particulate matter and ozone, the two pollutants most worrying for health.

Coal power plays a central role in Turkey's energy system. But coal power plants release substantial amounts of particulate matter, sulphur dioxide, and nitrogen oxides.

Other hazardous substances emitted from the smokestacks of coal power plants are heavy metals, such as mercury, and persistent organic pollutants (POPs), such as dioxins and polycyclic aromatic hydrocarbons (PAHs). Special concern for children's health arises from the large mercury emissions from coal power plants.

A large coal power plant emits several thousand tons of hazardous air pollutants every year and has an average lifetime of at least 40 years. Building new coal power plants would mean that hazardous emissions and their effects on health would continue for many years.

The Turkish health sector speaks out



In October 2014, five Turkish medical organisations, led by the Turkish Medical Association (TTB), stated their concerns about coal power plants, highlighting that these plants have a significant impact on the health of the Turkish population¹³. They call on the Turkish government to not go ahead with the building of new plants, make binding the use of best available techniques for existing plants and start the phase out of coal plants.

Emissions from coal power plants in Europe contribute significantly to the burden of disease from environmental pollution. The brand-new figures published in HEAL's report show that EU-wide impacts amount to more than 18,200 premature deaths, about 8,500 new cases of chronic bronchitis, and over 4 million lost working days each year. The economic costs of the health impacts from coal combustion in European Union are estimated at up to €42.8 billion per year¹⁴.

PUBLIC HEALTH INTERVENTIONS PAY OFF!

The largest health burden is attributable to the long-term impacts of chronic exposure to PM_{2.5}. In Europe and globally, measures have been taken that have demonstrated a swift benefit to public health.

In addition, a research project involving 25 European cities has demonstrated that the compliance with the WHO guideline of 10 µg/m³ for annual mean PM_{2.5} concentrations would increase the life expectancy of up to 22 months for people aged 30 years and older¹⁷.

The ban on coal burning in Dublin (Ireland) in the 1990s resulted in the reduction of black smoke dust by 71% and sulfur dioxide by 34%. This reduced the total mortality rate in the city by 8%, including reduction in cardiovascular diseases by 7% and respiratory by 13%¹⁵.

In Launceston, Australia, a new regulation of 2001 improved the air quality by reducing PM₁₀ dust by 38%. This leads to a decrease in total mortality by 11.4%, including reduction in cardiovascular diseases by 17.9% and respiratory by 22.8%. In winter period health benefits were even higher, reduction in cardiovascular diseases by 19.6% and respiratory by 22.9%¹⁶.

WHAT CAN MEDICAL EXPERTS DO?

Health and medical experts are becoming increasingly concerned about air pollution and the role of coal combustion, and they have continuously highlighted the enormous health risks of air quality. Medical experts in the USA such as the Physicians for Social Responsibility (PSR), Australian physicians, British Medical Journal, the Lancet, European Respiratory Society (ERS) and many others are vocal clean air advocates.

It is very timely that Turkish doctors and health experts communicate once more to their patients and to the public that current air pollution is a cause of adverse health effects and, that improvements of air quality do result in better health. At the same time health professionals should engage in policy processes with decision-makers to show how pollution can successfully be reduced.

The time is right to advocate on the health damage from coal. Based on the established scientific evidence about the health risks from coal combustion, doctors and health organizations can add a long neglected health perspective to the debate about Turkey's today's and future energy supply policies.

STEPS OF ACTION

Physicians

Consider environmental factors when diagnosing patient illness

Assess and include environmental information into the medical history of patients. Such information can be invaluable in discovering underlying causes of disease and contributing to the body of knowledge on environmental risks.

Check the air quality situation

Check the air quality situation in the area where your patient lives with the data from the local monitoring station for SO₂, NO₂ and PM₁₀ from www.havaizleme.gov.tr, the air quality monitoring system web site coordinated by the Ministry of Environment and Urbanization. Also, analyse the situation in your area over a longer time interval, with the data you can retrieve from the same database.

You can refer to the WHO Air Quality Guidelines for evaluation of the air quality in your region. (Please see *Further Information* section for the pollutant limit values.)

Public health professionals

Inform the public or flag up a health alert

Highlight to local authorities, the media, and the public if thresholds for SO₂, NO₂ and PM₁₀ are exceeded. Coal power plants in the region might contribute to high pollutant concentrations. Obtain weather data (e.g. wind directions) for the same period in order to determine potential point sources. Depending on the air quality situation, you may advise sensitive groups to stay indoors.

Engage in policy developments

Become involved in the legislative and executive debates on higher air quality standards at national level.

Highlight to national decision-makers that the health impacts and external costs of coal have to be taken into account in energy decisions. From a health perspective, building new coal power plants is detrimental to efforts of tackling chronic disease and creates unnecessary costs. Existing regulations need to be enforced and updated, stronger regulation needed.

Educate the public on health risks due to air pollution

Raise awareness on the health risks from coal power in local consultation processes (e.g. EIA public consultation processes) and help to ensure the enforcement of better pollution control for existing coal in order to protect public health. Also, use the opportunity to organise events to promote the importance of clean air.

FURTHER INFORMATION

<http://www.env-health.org>
http://www.who.int/topics/air_pollution/en
<http://www.eea.europa.eu>
<http://www.knowyourairforhealth.eu/>

WHO AIR QUALITY GUIDELINES ¹⁸	
PM2.5	10 µg/m ³ annual mean 25 µg/m ³ 24-hour mean
PM10	20 µg/m ³ annual mean 50 µg/m ³ 24-hour mean
O ₃	100 µg/m ³ 8-hour mean
NO ₂	40 µg/m ³ annual mean 200 µg/m ³ 1-hour mean
SO ₂	20 µg/m ³ 24-hour mean 500 µg/m ³ 10-minute mean

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Facebook: [HEAL's European coal and health campaign](https://www.facebook.com/HEALs-European-coal-and-health-campaign)

The Health and Environment Alliance (HEAL) is a leading European not-for-profit organisation addressing how the environment affects health in the European Union (EU). With the support of more than 70 member organisations, HEAL brings independent expertise and evidence from the health community to different decision-making processes. Our broad alliance represents health professionals, not-for-profit health insurers, doctors, nurses, cancer and asthma groups, citizens, women's groups, youth, environmental NGOs, scientists and public health research institutes. Members include international and Europe-wide organisations as well as national and local groups.

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