AIR QUALITY

BRIEFING

Air Pollution and Health in Montenegro

Facts, Figures and Recommendations

HEAL
Promoting environmental policy that contributes to good health

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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 globally[1]. Worldwide an estimated 7 million people died prematurely because of pollution; in the European Union (EU) 400,000 people suffer a premature death[2]. The Organisation for Economic Cooperation and Development (OECD) predicts that in 2050 outdoor air pollution will be the top cause of environmentally related deaths worldwide[3]. In addition, air pollution has also been classified as the leading environmental cause of cancer[4].

Impacts of air pollution in Montenegro

According to the European Environmental Agency (EEA) in 2010, 513 people in Montenegro died prematurely from particulate matter (PM) and ozone exposure[5].

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 death[6]. 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 diabetes[7]. 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.

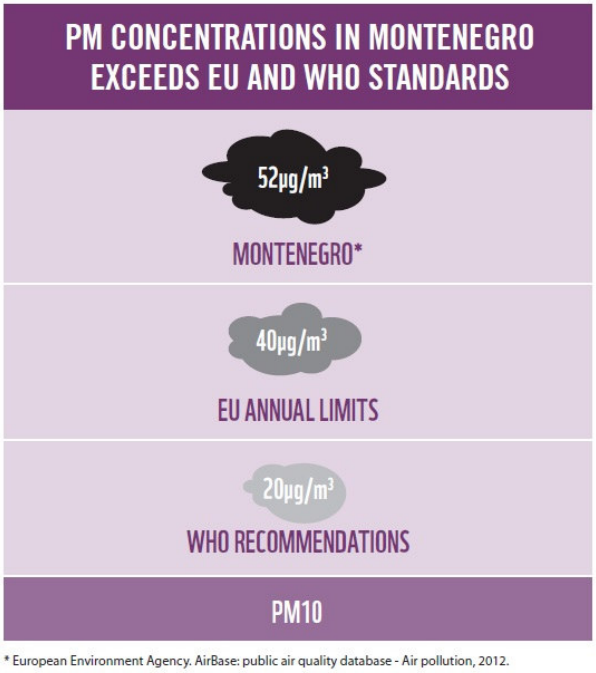
The health effects of air pollution are well documented, even though the pollution mixtures in the air can be complex. Air pollution exists as a mixture of liquid and solid phases; a mixture of gaseous, volatile, semi-volatile and particulate matter, and its exact composition varies widely. The main 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 MONTENEGRO

Air quality in Montenegro is a big concern: measurements show that citizens all over the country breathe in air that is considered harmful to health. For example, concentrations of PM10 in 2012 was 52 µg/m3[8], which is much higher than what the EU and the World Health Organization (WHO) have set to protect health.

A recent report in Montenegro on air quality in 2013[9] states that during that year, the annual limit value for PM10, 40 µg/m3, was exceeded in some of the locations. For example, in the cities Berane, Bijelo Polje i Pljevlja, Bar, Cetinje, Nikšić i Podgorica, the report states it is neccessary to employ air pollution measures and improve air quality.

During 2013, 65% of the population in urban or urban-industrial cities in Montenegro was potentially exposed to the concentrations of pollutants above the reference level[9].



* European Environment Agency. AirBase: public air quality database - Air pollution, 2012.

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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 function[10].

Studies show that lung function growth in children is reduced in areas with high PM concentrations[11]; 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 pollution[12]. 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 effects[13].

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, neuroinflammation, 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 antisocial 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.

How does coal contribute to air pollution in Montenegro?

Coal power generation adds to already poor air quality in Europe and in Montenegro - caused mainly by the transport sector, industrial processes, residential heating, and agriculture.

Coal power plants release substantial amounts of particulate matter, sulphur dioxide, and nitrogen oxides, with the latter contributing indirectly to the formation of ozone. Of these, the most worrying for health are fine particulate matter (PM2.5) and ozone.

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 chemicals (PAHs). Special concern for children's health arise 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. It would also counterbalance short-term reductions in air pollutants achieved in other sectors.

Pljevlja city – leader in bad air quality in the region

During 2012, in the city of Pljevlja there were 217 days exceeding the daily limit values for particulate matter (PM10), and the average annual concentration was very high, with a record of90 µg/m3[9]. With this numbers, the city of Pljevlja is the leader among the most polluted places in Europe.

Emissions resulting from the combustion of coal in power plant and combustion in households were the main contributors to the bad air quality in Pljevlja. It has been estimated that costs from power plant emissions in 2014 were as high as €389 million[14].

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 Europe are estimated at up to €42.8 billion per year[15].

Public health interventions pay off!

The largest health burden is attributable to the long-term impacts of chronic exposure to PM2.5. In Europe and globally, measures have been taken that have demonstrated a swift benefit to public health.

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%[16].

In Launceston, Australia, a new regulation of 2001 improved the air quality by reducing PM_{10} dust by 38%. This lead 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%[17].

In addition, a research project involving 25 European cities has demonstrated that the compliance with the WHO guideline of 10 g/m3 for annual mean PM2.5 concentrations, would increase the life expectancy of up to 22 months for people aged 30 years and older. Considering PM10, the compliance with the WHO guideline of 20 g/m3 in annual mean could save 2,000 lives each year in Montenegro through this improvement in air quality[18].

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.

In light of the ongoing EU accession process of Montenegro, it is very timely that Montenegrin doctors and health experts communicate 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 abated and 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 organisations can add a long neglected health perspective to the debate about Montenegrin future energy supply.

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. Also, analyse the situation in your area over a longer time interval.

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 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 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 enforces 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 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://env-health.org
http://www.who.int/topics/air_pollution/en
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