EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 8
Issue: 9
126-128
Year: 2021

POLLUTED AIR AS A PREDICTOR OF HEALTH ISSUES IN PEOPLE

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Article Received on 01/07/2021 **Article Revised on 21/07/2021** **Article Accepted on 09/08/2021**

SUMMARY
Definition of air pollution encompasses the presence of one or more substances in the air in concentrations that might be harmful to the life and health of people. Economic development and rapid population growth have led to exploitation of huge amounts of resources to maintain different activities causing different types of pollution. According to the World Health Organization, the six main air pollutants are particulate matter, ground-level ozone, carbon monoxide, sulphur oxides, nitrogen oxides and lead. Adverse effects of air pollution on pulmonary and cardiovascular systems have been identified in a number of considerable epidemiological and observational studies. Long-term exposure to polluted air can cause increase in morbidity and mortality, mostly due to cardiovascular and respiratory diseases. Air pollution in the environment is considered to be the main risk factor in the occurrence and development of certain diseases, such as asthma, lung cancer, ventricular hypertrophy, Alzheimer's and Parkinson's diseases, psychological complications and autism. Air pollution leads to consequences in vulnerable population, such as children, older people as well as people with low socioeconomic status across the world.

KEYWORDS: Air pollution, human health, respiratory tract diseases, cardiovascular diseases, environment.

INTRODUCTION

Air pollution is the leading concern in the world considering the fact that it poses a serious toxicological influence on human health and the environment. We can differentiate between different sources of particle matter emissions, but the greatest source of air pollution is motor vehicles and industrial processes. According to the World Health Organization, the six main air pollutants are particulate matter, ground-level ozone, carbon monoxide, sulphur oxides, nitrogen oxides and lead.[1]

Rapid economic development and rapid population growth have led to the huge number of resources needed for the society to maintain necessary activities resulting in different types of pollution. One of the problems of pollution is air pollution which causes serious concern in the world due to its wide nature and potential human health risk. Even though there is a concern related to the air particulate matter emission originating from anthropogenic sources, the society still relies on fossil fuels for different uses, such as power generation, transport, industrial and residential heating resulting in worse air quality especially in developing countries.[2]

Air pollutants

Air pollutants are all substances which harm people and the environment. They can be solid, liquid and gaseous air pollutants. Even though there are natural air pollutants, which can have even stronger effects than the ones caused by human activity, artificial sources of pollution caused by human activity pose special problems. They are especially prominent in big cities and industrial zones. In general, air pollutants are divided into indoor air pollutants and outdoor air pollutants.[3]

With constant life quality development, indoor air quality has become a matter of significance in the 21st century. A number of factors, including types and conditions of work, ventilation, as well indoor activities affect indoor air quality. [4] Contaminated outdoor air is characterized by the presence of ozone (O3), particulate matter (PM2.5 and PM10) and sulphur dioxide (SO2), while outdoor ones are characterized by formaldehyde (CH2O), nitrogen dioxide (NO2) and volatile organic compounds. Some research implies that indoor air is much more polluted in comparison to outdoor air and can cause numerous health issues. [5]

Primary source of indoor air pollution is modern houses with inadequate, i.e., impermeable ventilation used to reduce heating and cooling expenses. Issues are also caused by formaldehyde and volatile organic compounds released from new furniture, synthetic carpets, colors and building material. Tobacco smoke, cooking, cleaning and

wood burning contribute to significant production of particulate matter, which cause asthma attacks and increase in death from respiratory illnesses, while high temperatures and humidity stimulate mold growth. The most commonly identified indoor mold species are *Aspergillus* and *Penicillium*. [6] Mold spores are air-born and thus can enter human respiratory system. Other sources of air pollution include cooking and heating gases (nitrate dioxide, carbon monoxide), chemicals from candles and cleaning agents, particulate matter entering indoor spaces from the outside environment (ozone, particulate matter, etc.), pesticide toxins and air refreshers. Indoor air pollutants display seasonal and spatial variations, so during winter there is an increase in the levels of volatile organic compounds, particulate matter, carbon monoxide and during summer the number of bacteria and mold due to high temperatures and humidity.[7]

Adverse health effects

Air pollution is a big problem for public health affecting 9 out of 10 individuals living in urban areas around the world. Exposure to air pollution is the 9th leading risk factor for cardiopulmonary death. Air pollutions is an important factor contributing to lung disease, but at the same time causes consequences in vulnerable population, such as children, older people as well as people with low socioeconomic status across the world.[8] Long-term exposure to contaminated air can cause increase in morbidity and mortality, mostly due to cardiovascular and respiratory diseases. Air pollution in the environment is considered to be the main risk factor in the occurrence and development of certain diseases, such as asthma, lung cancer, ventricular hypertrophy, Alzheimer's and Parkinson's diseases, psychological complications and autism.[9]

Children are very sensitive to adverse effects of contaminated air due to their fast-developing lungs, incomplete immunological and metabolic functions and high level of outdoor activities. A health study exploring effects of contaminated air on the health of children implies that exposure to the regional environmental air and traffic-related pollutants is connected to the increased asthma prevalence, asthma in babies, bronchitis risk, whooping cough, decreased lung function and inflammation of the respiratory tract.[10]

Comparing to the rest of the population, older people are potentially sensitive to air pollution effects during normal and pathological aging. Studies on air pollution effects in older people show statistically significant short-term and chronic adverse effects of different air pollutants on cardiopulmonary morbidity and death in older people. When exposed to air pollution, older people are more often admitted to hospital due to asthma and chronic obstructive pulmonary disease.[11] Adverse effects of air pollution on pulmonary and cardiovascular systems have been identified in a number of considerable epidemiological and observational studies. Air pollution is also related to central nervous system disorders, including stroke, Alzheimer's disease, Parkinson's disease and neurodevelopmental disorders. These studies imply that different component of particulate matter in the air can be easily transferred to the nervous system where they can activate congenital immune response. Also, systemic inflammation coming from the lung or cardiovascular system can affect the health of the central nervous system.[12]

According to the World Heath Organization, around 3 billion people around the world still cook and heat their homes using solid fuel which produces a large amount of air pollutants (such as SO2, NOx, CO and PM). The mentioned pollutants can accumulate indoors if the spaces are not well aired, which seriously affect the health of people. [13] Radon, colorless, radioactive gas and the second most significant cause of lung cancer in many countries, causes problems in many houses built from stone building material or basements with bad ventilation. [14]

CONCLUSION

Based on reviews of publications analyzing impacts of indoor and outdoor air contamination on human health, we can conclude that the air is one of the environmental factors with greatest impact on human health and air pollution is one of the biggest public health problems with long-term impact on health and life quality. In accordance with the above said, it is necessary to conduct continuous procedures which will contribute to reducing adverse effects of air pollution on human health and respiratory diseases. Considering the issues of adverse effects of air pollution, it is necessary to establish a cooperation on national level between the government, industry, energy companies and wider community to work together on solving the issues of air quality on local, national and global level.

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