



Introduction to the effects of environmental pollutants on human health

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Abstract

The relationship between the environment and human health has been thoroughly researched, and environmental dangers have been shown to have an impact on human health, either directly through exposure to dangerous substances or indirectly through ecosystem disruption. Climate change also poses a threat to human health and well-being and is consequently becoming a major worry around the world. Continuous environmental imbalances come from economic expansion and population growth. The most powerful factors of environmental health problems are increased industrialization, modernization, and increased energy usage. The health risks posed by the environment in developing countries are exacerbated by widespread poverty, a lack of public infrastructure (such as access to drinking water, sanitation, and health care), and the emergence of industrial pollutants. Environmental contamination takes many forms, all of which have an impact on human health.

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Introduction

Environmental health is concerned with all physical, chemical, and biological aspects that affect a person's behaviour. It entails evaluating and controlling environmental elements that may have a negative impact on one's health. Its goal is to prevent sickness and create surroundings that promote good health. This definition excludes non-environmental behaviour, as well as behaviour related to the social and cultural environment and genetics (WHO 2015).

Natural elements such as air, water, soil, and even social factors, as well as "built" elements such as physical structures and systems such as homes, offices, schools, farms, and factories, roads and transit networks, land use patterns, and waste management systems, make up our environment. Both of these environmental factors can have a direct and/or indirect impact on our health and well-being. Ironically, the activities that make life more comfortable have unintended consequences that disrupt the natural equilibrium of the environment and, as a result, human health.

We are products of our environment physically as well as socially and as such are influenced by it at every step of our life. As a result, it's probably reasonable to say that nothing has as big of an impact on our health as our surroundings. The study of environmental health comprises comprehending the impact of both natural and man-made vulnerabilities/ hazards in our surroundings on both the quality of life and the number of years of healthy life lived, as well as applying this knowledge to safeguard humans and environmental systems.

Environmental health is a branch of study that investigates how the environment affects human health and disease, with the objective of preventing or reducing health risks. Maintaining a healthy environment is critical to improving one's quality of life and increasing the number of years one can live healthily. Environmental health is concerned with all components of the natural and constructed environment that affect human health.

The effects on the environment are numerous and extensive. Pollution of the environment, especially as a result of human activity, has become a global concern. Environmental contaminants affect every element of human existence, contributing to a wide range of communicable and non-communicable diseases and impairments (Table 1). To stress the scale of environmental pollution and its influence on human health, a brief synopsis of important contaminants and their health impacts is provided.

Smog in the Air

Air pollution has been a major problem in recent decades, with serious toxicological consequences for both human health and the ecosystem. Pollution comes in many forms, ranging from a single cigarette to massive volumes of emissions from automotive engines and industrial activity [1, 2]. Carbon monoxide (CO), Sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOCs), ozone (O₃), heavy metals, and respirable particulate matter are the most significant air pollutants (PM_{2.5} and PM₁₀). Other major air pollutants classified as carcinogens/mutagens include volatile organic compounds (VOCs) such as toluene, benzene, xylene, and ethylbenzene; polycyclic aromatic hydrocarbons (PAHs) such as acenaphthene, acenaphthylene, anthracene, and benzopyrene; and other organic pollutants such as dioxins, which are unwanted

Air pollution is commonly used to refer to the pollution that occurs outside the home. Indoor air pollution, on the other hand, is mostly caused by the cooking of coal and biomass fuels; heating and lighting, combined with inadequate ventilation, have been shown to contribute significantly to disease burden, particularly in developing countries [4, 5]. Long-term impacts of air pollution are commonly acknowledged to include disorders including respiratory infections and inflammations, cardiovascular dysfunctions, and some malignancies [6-10]. Every year, millions of people die as a result of air pollution

[11]. In addition, a recent study found a link between male infertility and air pollution [12].

Polluted Water

When untreated waste material enters water sources, it pollutes the water [13] and harms the environment and human health [14]. Water is a valuable natural resource that is utilized for drinking and is required for all metabolic processes in all living things. Water is a key cause of infection at the same time. Waterborne infections account for 80% of all diseases, according to the World Health Organization. Several countries, particularly underdeveloped countries, have drinking water that does not satisfy WHO criteria. Water that is unclean and of poor-quality causes 3.1 percent of deaths [15]. Water pollution is caused by the discharge of domestic and industrial effluent wastes, leakage from water tanks, marine dumping, radioactive waste, and atmospheric deposition. Biological and chemical pollutants are two types of water contaminants [16]. Biological pollutants include bacteria, viruses, and helminths, which can cause infectious disorders such as cholera, typhoid fever, gastroenteritis, malnutrition, anemia, and hepatitis. Heavy metals like arsenic and nonmetallic elements like fluoride are examples of chemical contaminants that can contaminate water supplies and harm human health in a variety of ways. Other chemical wastes, such as toxins found in industrial waste, pesticides, and pharmaceutical waste, are now being blamed for serious health problems such as immune suppression, reproductive failure, endocrine abnormalities, and acute poisoning. Chemical toxins are currently the subject of research to determine the degree of their negative health effects as well as water treatment solutions to eliminate them.

Noise pollution

Noise pollution, commonly referred to as environmental noise or sound pollution, is the transmission of sound that has a negative impact on human activity. Noise exposure that is high in intensity and/or for a lengthy period of time is

harmful to human health. High noise levels can contribute to cardiovascular morbidity, including an increased incidence of coronary artery disease [17, 18], in addition to the well-known impacts on hearing and sleep. The evidence for a link between noise exposure and neurological diseases is growing [19]. Youngsters are especially vulnerable to noise, according to the WHO, and the impacts of noise on children may be lifelong (WHO). Noise is hazardous to a child's physical and psychological health, as well as to his or her learning and behaviour [20].

Radioactive pollution

In our daily lives, we are constantly exposed to radiation. Activities involving radioactive materials, such as mining, handling, and processing radioactive materials, handling and storage of radioactive waste, and the use of radioactive reactions to generate energy (nuclear power plants), as well as the use of radiation in medicine (e.g., X-rays, CT scans, and radiotherapy) and research, are all examples of human activities that can release radiation. These hobbies could expose you to a lot of radiation. They also contribute to low-dose radiation in the environment. Cancers, eye diseases, cardiovascular and cerebrovascular diseases, psychiatric disorders, and teratogenesis are all linked to low-dose radiation exposure [21].

Soil Pollutant

Exposure to a potentially toxic pollutant in the soil can have serious health consequences, including lung, kidney, liver, and cancer as a result of chromium exposure [22], adverse effects on cognitive development in children as a result of lead exposure [23], skin, lung, and gastrointestinal tract cancers, as well as a variety of disorders in the circulatory system, liver, kidney, nervous system, and heart as a result of arsenic exposure [24], and kidney, bone, and pulmonary damages [25].

Despite the fact that there are numerous exposure routes, ingestion of soil particles and dust through outdoor hand-to-mouth activities is one of the

most common. Mining and smelting, fossil fuel combustion, application of fertilizers, fungicides, and other soil amendments such as compost and sewage sludge, waste disposal of industries (particularly metallurgical, electronics, and chemical), traffic emissions, and waste incineration are all well-known anthropogenic sources of potentially toxic elements and organic pollutants that cause widespread emission into the soil environment. Among these, waste management is a major source of chemical contaminants in the soil.

Neglected Environmental Pollutants: Impact On Health

Endocrine-Disrupting Compounds

Organochlorines, phthalates, bisphenol A, polychlorinated biphenyls, polyfluoroalkyl compounds, brominated flame retardants, organotin, dioxins, and alkylphenols are examples of endocrine-disrupting compounds (EDCs), which are widely distributed in water and other elements of our environment [26,27]. EDCs can alter the human endocrine system through a variety of methods. EDCs are linked to a variety of illnesses, including infertility, type 2 diabetes, metabolic syndrome, and some malignancies [28-32].

Antibiotics

The spread of antibiotics and other antimicrobial chemicals into the natural environment is also a major concern. These chemicals have the potential to accelerate the spread of microorganisms that are resistant to antibiotics. Pharmaceuticals and personal care items from

households, hospital waste with high concentrations of antibiotics and disinfectants, and substances from industrial activity, including heavy metals, are all found in municipal wastewater [33, 34]. Furthermore, commercial animal farms' indiscriminate and excessive use of antibiotics and disinfectants to boost profit margins has exacerbated the problem. Antibiotic-resistant microorganisms are becoming one of the largest worldwide health concerns today as a result of this contamination of water and soil.

Impact Of Climate Change On Human Health: A Major Threat

Climate change is an impending environmental hazard to human survival, in addition to traditional environmental pollutants. The naturally occurring climatic vacillation has long had an impact on human societies. Human activities, combined with population growth, are, nonetheless, affecting the world's climate in a relatively short amount of time. Climate change is an impending environmental hazard to human survival, in addition to traditional environmental pollutants. The naturally occurring climatic vacillation has long had an impact on human societies. Human activities, combined with population growth, are, nonetheless, affecting the world's climate in a relatively short amount of time. The UN's Intergovernmental Panel on Climate Change declared in its Third Assessment Report (2001) that the warming observed over the last 50 years is due to human activity [35]. Since 1880, global yearly temperatures have risen at an average pace of 0.07 °C (0.13 °F) every decade, and at an average rate of 0.17 °C (0.31 °F) per decade since 1970 [36], affecting the functioning of many ecosystems and species.

Table. 1: Major pollutants and their effects on human health

Source of Pollution and Pollutants		Effects on Human health
1	Air pollution	
	Sulfur dioxide	Chronic bronchitis, irritation of eyes nose and throat.
	Carbon monoxide	Slight headache to nausea
	Particulate matter	Upper respiratory infection, cardiac disorder, bronchitis, asthma, pneumonia, emphysema
	Lead	Anemia, destructive behaviour, learning disabilities, brain damage and death
	Ozone (Key component of photochemical smog)	Irritation of the eyes, nose and throat, reduces lung function
2	Water pollution	
	Bacteria, viruses, worms, plasmodiumetc	Cholera, diarrhoea, malaria, typhoid fever, filariasis, amoebiasis, hepatitis A, trachoma (eye infection)
	Fluoride	Fluorosis
	Arsenic	Arsenicosis
	Lead	Lead poisoning
	Antibiotics	Antibiotic-resistant bacteria
	Environmental Endocrine disruptors	Obesity, diabetes, liver abnormalities, Infertility, cancer
3.	Soil pollution	
	Pesticides and fertilizers contain benzene, chromium, and other chemicals.	Cancer
	When chemicals like mercury and cyclodienes are present in the soil	Kidney and Liver Disease
	Lead	Brain and Nerve Damage
	Arsenic	Arsenicosis
4.	Radiation pollution	
	Non-ionizing Radiation (Alpha (), beta (), and gamma () radiations	Mutation, leukaemia, skin cancer, cause damage to the fetus

The impact of climate change on several elements of human health has been exacerbated by recent significant increases in population size, energy consumption, land-use intensity, international trade and travel, and other human activities.

Every year, diseases related to air pollution kill and hospitalize millions of people. According to World Health Organization estimates, one out of every eight fatalities worldwide is caused by

conditions related to air pollution. New research has found significant correlations between the development of respiratory and cardiovascular disorders and both outdoor and indoor air pollution. Ischemic heart disease, stroke, chronic obstructive pulmonary disease (COPD), lung cancer, and acute lower respiratory infections in children are among the most prevalent diseases induced by air pollution." The deposition of calcium or other materials like fat within

the coronary artery is connected to ischemic heart disease or coronary heart disease," says Kevin Wood, Vice President of Sales & Marketing at Camfil USA. "Blockages form, preventing blood from reaching the heart and other vital organs."

According to new research, air pollution hastens artery blockage, increasing the risk of ischemic heart disease. Strokes are caused when the blood supply to the brain is cut off. Particulate air pollution has been related to strokes. Strokes can cause permanent brain damage or even death. COPD is a term that refers to a group of disorders that make breathing difficult. Bronchitis and emphysema are two of these diseases, both of which are caused by air pollution damage to the lungs. Lung cancer is caused by unregulated cell division in the lungs and is linked to air pollution, particularly particulate matter pollution and secondhand smoke. Lower respiratory infections commonly appear as pneumonia; however, they can also manifest as other illnesses. Because their bodies and lungs are still developing, children are more susceptible to getting acute lower respiratory tract infections than adults.

A variety of substances cause liver damage and potentially cancer (due to DNA damage) (e.g., chlorinated solvents, MTBE). A range of substances have caused kidney injury. Problems with the nervous system - harm to the neurological system - are frequently caused by pesticides or other toxins (e.g., DDT). A range of chemicals, including endocrine disruptors, induce reproductive and endocrine damage, including disrupted sexual development, inability to breed, poor immunological function, lower fertility, and an increase in several types of malignancies. Thyroid problems (a major cause is an exposure to perchlorate, a chemical found in vast bodies of water). Malaria-carrying mosquitoes grow in polluted water, killing between 1.2 and 2.7 million people each year. Bathing in contaminated water (i.e. dirty beach water) has been linked to a number of less serious health impacts, including rashes, earaches, and pink eyes.

Liver cancer - Fine particulate matter exposure can promote the growth of liver tumours by

causing low-grade inflammation. Colorectal cancer can be caused by a variety of environmental factors, ranging from food poisoning to chlorinated water. Brain tumour - Air pollution has been related to an increased risk of brain tumour development. Emphysema - Air pollution raises the incidence of respiratory disorders, including emphysema, according to medical science. The American Heart Association has connected air pollution exposure to an elevated risk of cardiovascular disease and mortality. Atherosclerosis - Particulate matter pollution can lead to heart attacks and strokes. Hepatitis A Hepatitis A is an infectious disease that can be contracted by drinking polluted water, among other things. Lung cancer - It is well known that air pollution increases the risk of respiratory disorders and lung cancer. Memory loss - Pollution particles can irritate the brain, causing sadness, memory loss, and cognitive issues. Leukemia - Traffic pollutants, particularly benzene, have been linked to the development of leukaemia, particularly in youngsters.

Globally, studies have shown that rising temperatures have an influence on the availability of safe drinking water, clean air, and food (WHO 2017). Climate change has been connected to a variety of infectious and respiratory ailments, as well as mental and neurological disorders, and aquatic and vector-borne diseases. Apart from health, issues such as population migration and migrant health, the identification of vulnerable populations as a result of extreme events and their susceptibility to likely health outcomes, as well as their management and adaptation strategies, will all be important to consider in the face of climate change.

Conclusion

Globally, environmental deprivation is a significant threat to human health. Human health is already suffering as a result of these environmental changes, and it is expected to deteriorate significantly over the next 50 years. Improving air quality and ensuring enough supplies of safe drinking water are linked to large

financial rewards for human health and happiness. In terms of public health benefits, climate change mitigation effects are also very important.

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