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Effects of Air Pollution on Human Health and Well-Being

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Abstract

The environment, human health, and property damage can all be negatively impacted by air pollution. The link between human health and air quality has been established by numerous studies. Laboratory and epidemiological research showed that ambient air pollutants (such as PM, O3, SO2, and NO2) were linked to a number of respiratory conditions, such as asthma, bronchitis, and emphysema. Discussing the connection between air quality and human health is the aim of this paper. This conceptual study focuses on the results of a literature review on air quality and the substantial health impacts associated with it.

Keywords: Air pollution; health effects; respiratory; particulate matter

Introduction

All living things, including humans and animals, require clean air for optimal health and wellbeing. However, the air is constantly contaminated because of unabated urban growth. Due to the high population density and activities of people living in urban areas, the ambient air in cities is more polluted than the atmosphere as a whole; it creates air pollutants at a faster pace than in less developed areas and the natural environment (Ling et al. 2012). As an illustration, metropolitan conurbations such as the Klang Valley, which have a high traffic volume and a high density of developments, are a contributing factor to the decline in urban air quality. According to Ling et al. (2010), there is a discernible upward trend in the number of unhealthy or dangerous days in India, which rose from 11 days in 2001 to 67 days in 2005 in Kuala Lumpur. Aside from that, the monsoon wind from Sumatra caused the worst (unhealthy) Air Pollution Index of 118 in August 2012, according to air quality monitoring at Port Klang, Selangor (JAS, 2012). The majority of cities in developing nations, not just the Klang Valley, are dealing with rising environmental pollution from automobile emissions, as well as from businesses and home heating sources, at a level that surpasses the ability to disperse and dilute pollutants to levels of exposure that are safe (UN, 2001). The World Health Organization (WHO) declared that urban air pollution is a serious public health issue and that the effects of indoor and outdoor urban air pollutants cause over 2 million premature deaths annually (WHO, 2006).

Nonetheless, the effects of air pollution on public health are quantified not only in terms of illness and mortality but also in terms of missed educational and other possibilities for human development as well as lost production (UN, 2001). Public awareness of urban air pollution has grown as a result of the detrimental health effects, which include mortality, cardiovascular illnesses, and respiratory morbidity.

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Since they provide the foundation for a reformulation or revision of the current air quality regulations, health evaluations and assessments have grown in significance (Colls & Micallef, 1997). According to the Clean Air Act of 1970, the biggest risks to human health were pollutants including lead, sulfur dioxide, carbon monoxide, particulates, volatile hydrocarbons, and photochemical oxidants (Cunnningham et al, 2005).

Without a question, these pollutants have the potential to endanger both the environment and human health in addition to seriously damaging property. According to many academics, of the six pollutants that pose the greatest harm to human health, particle pollution and ground-level ozone rank highest. Laboratory and epidemiological research also showed that ambient air pollutants, such as PM, O3, SO2, and NO2, were linked to a number of respiratory conditions, such as asthma, bronchitis, and emphysema (Ling et al., 2012).

Environmental health

Human health and a healthy environment are closely related, and environmental health is frequently caused by an imbalance brought on by inadequate environmental and individual adjustment (Botkin & Keller, 2007). It focuses on the extrinsic causes of disease, such as aspects of our social, cultural, technical, and environmental environments (Cunnigham & Saigo, 2005). According to Cunningham and Saigo (2005), a sickness is an aberrant alteration in the body's state that affects psychological or physical processes. Ahluwalia and Malhotra (2008) assert that the environment is made up of the air, water, and soil. An environment can be classified as either natural or man-made. The natural environment includes all of the elements that have an impact on an organism throughout its life, including air, water, soil, radiation, land, forests, wildlife, plants, and animals. Concerns about science, nature, health, employment, profits, politics, ethics, and economics are all part of environmental challenges from a human standpoint (Enger & Smith, 2000). Political jurisdictions are typically taken into consideration while making the majority of social and political decisions. These fabricated, political realms are not inherently linked to environmental issues. According to Enger and Smith (2000), air pollution can range from minor issues like governments to major ones like multinational states. The atmosphere, hydrosphere, lithosphere, and biosphere are the four components that make up the environment.

Gravity holds the planetary layer of gases that surrounds the Earth in place (Kemp, 2004). The atmosphere is in charge of keeping life on Earth alive by shielding the planet and its people from the Sun's harmful UV radiation. Additionally, it includes gases that are necessary for life, such carbon dioxide and oxygen, for its occupants [Ahluwalia & Malhotra, 2008]. Although ozone is a hazardous pollutant in the atmosphere, the stratosphere uses it as a shield to block ultraviolet light (Cunningham et al, 2005).

Air

Normally, the atmosphere, or air, is made up of 20% oxygen, 79% nitrogen, and 1% carbon dioxide, water vapor, and trace amounts of a number of other gases. The gravitational force keeps the majority of the atmosphere near the Earth. Consequently, its closest point to the Earth's surface has a thinner composition (Enger & Smith, 2000). The troposphere, a relatively dense layer of gases nearest to the Earth's surface, the stratosphere, which is farther away and contains similar but less dense gases, and the ionosphere, which is made up of ionized gases, make up the atmosphere (Enger & Smith, 2000). In addition to gaseous components, the atmosphere also contains non-gaseous materials including particulate matter and aerosols, which are solid or liquid particles released into the atmosphere (Kemp, 2004). Although the components involved, such as dust, soot, smoke, and salt particles, are regularly produced by natural processes like volcanic activity, forest or grass fires, evaporation, and air movement, Kemp (2004) added that they are frequently confused with air pollution. In contrast, spores, pollen grains, bacteria, viruses, and a variety of other microscopic particles are created and released by normal biological processes. The atmosphere is crucial because it serves a number of purposes that have enabled human development and survival practically everywhere on Earth's surface (Kemp, 2004).

The atmosphere supplies and sustains the oxygen needed for life; it regulates the earth's energy

budget through the ozone layer, the greenhouse effect, and internal circulation; it disperses heat and moisture throughout the surface of the planet; and it has the ability to remove waste products and pollutants produced by human or natural activity. According to Kemp (2004), the atmosphere is made up of a mixture of gases as well as liquid and solid particles in proportions that change over time and space. When the atmosphere cannot expel the material being added to it, gases and aerosols accumulate and pollute the atmosphere, a condition known as air pollution.

Air pollution

One issue facing the modern world is pollution, which is the unwelcome deterioration of the natural environment by both natural and human-induced insults (Wiwanitkit, 2011). The number of individuals is increasing quickly as a result of the global population growth. It is acknowledged that pollution affects everyone, not just a certain demographic. Air, water, and land (or soil) pollution are all considered forms of environmental pollution. According to Enger & Smith (2000), pollution is something that people create in sufficient amounts to affect our health or general well-being. The population expansion and technological advancements that influence the methods used to create pollution are the two main causes of pollution (Enger & Smith, 2000). More practically speaking, pollution results from the inefficiencies of processes that humans have constructed. The extraction of raw materials, the production of products, and the electricity required for manufacturing processes and products all have built-in inefficiencies that result in a significant amount of waste (pollution) that is no longer useful (Wagner, 1994). According to Cinnigham et al. (2005), air pollution is defined as physical or chemical alterations caused by human activity or natural processes that lower air quality. Because the pollutants were discharged into the atmosphere more quickly than the atmosphere could absorb and disperse them, the large-scale emission of smoke and other waste products created a hazardous environment (Enger & Smith, 2000). People have long acknowledged the existence of both natural and man-made air pollution (Botkin & Keller, 2007); in 1550, Leonardo da Vinci described how elements released into the atmosphere by trees created a blue haze. Natural pollutants, primary pollutants, and secondary pollutants are the three categories into which air pollution is divided. Pollutants that enter the atmosphere naturally are known as natural pollutants. Pollen dispersal and lightning-caused forest fires are two instances of natural pollutants. The main pollutants and their effects will be the main topic of this essay. Carbon monoxide, hydrocarbons, particulates, sulfur dioxide, and nitrogen compounds are the five main categories of materials that are released into the atmosphere in their unaltered forms and in large enough quantities to be harmful to human health (Enger & Smith, 2000). When an energy source is present, these materials can interact to create new secondary air pollutants like ozone, highly reactive substances, and naturally occurring chemicals.

Health effects of air pollution

We are starting to understand that every effect we have on the environment also affects ourselves, even though we have taken advantage of our amazing power to change it. Wagner used the analogy of a fish bowl to describe the environment and pollution in 1994. In other words, the Earth is a closed habitat; what enters stays out, much like a fish bowl. Emitted or discharged pollutants do not go away; they will continue to affect us. The risk of being impacted by pollution is great because of the world's and India's relentless urbanization. The impacts of both indoor and outdoor air pollution in cities (produced by the burning of solid fuels) are responsible for about 2 million premature deaths annually. The people in poor nations bear more than half of this disease burden (WHO, 2006). Compared to similar groups in cleaner locations, those who breathe unclean air have a much increased risk of lung cancer, heart attacks, and respiratory illnesses (Cunningham et al., 2005). In cities, poor air quality has been directly linked to hundreds of fatalities. In October 1948, an incidence of air pollution that was detrimental to human health happened in Donora, Pennsylvania. Dense haze developed in the region as a result of pollutants from a zinc refinery and steel mills that were trapped in the valley. In just five days, 5910 individuals fell ill and 17 people died. Almost half of the 12,300 residents of the city were impacted

by the contaminated air (Enger & Smith, 2000). Even at reduced air pollution levels permitted by the current European Union air-quality guidelines, a study published in the Lancet Respiratory Medicine reveals that air pollution during pregnancy may raise the risk of lower birth weight newborns. 74,000 women who gave birth to singletons between 1994 and 2011 were included in 14 cohort studies from 12 European nations, which were analyzed using data from the European Study of Cohorts for Air Pollution Effects (ESCAPE). The results demonstrated that traffic density and all air pollutants, especially fine particulate matter (PM2.5, which has a diameter of 2.5 micrometers or less), decreased a child's average head circumference at birth and raised the chance of low birth weight at term. The typical levels of pollutant exposure in the study group varied from less than 10 micrograms per cubic meter (10µg/m³) to over 30µg/m³. According to the researchers, the risk of low birth weight at term rises by 18% for every 5µg/m³ increase in PM2.5 exposure during pregnancy (Lancet, 2013). According to Enger & Smith (2000), exposure to air containing 0.001 percent carbon monoxide for several hours can be fatal. This is due to the fact that CO tends to build and lower the blood's ability to carry oxygen since it stays bound to hemoglobin for a long time, even in trace amounts. Furthermore, headaches, fatigue, and blurred vision can be brought on by the carbon monoxide generated in busy traffic. In addition, compared to drivers who do not smoke, heavy smokers in crowded traffic may have significantly slower reaction times due to their double exposure and oxygen-carrying capability. Because they can enter the lungs and harm respiratory tissues, respirable particles smaller than 2.5 micrometers are among the most harmful particulates. Due to their carcinogenic properties, asbestos fibers and cigarette smoke are considered to be among the most hazardous respirable particles in indoor and urban air (Cunningham et al, 2005). Carcinogens are substances that have the potential to cause cancer, which makes them dangerous. Particulates pose the greatest health concerns from routine exposures. According to Botkin and Keller (2007), people with respiratory conditions are more likely to be impacted by air pollution. Furthermore, research indicates that air pollution can lead to stress in humans in addition to its negative health impacts. According to a study by Sahari et al. (2012), human stress can be influenced by the environment. While an unhealthy atmosphere can lead to issues and ultimately stress, a good and healthy environment can have great effects on people. According to the study, one of the things that contribute to human stress is poor air and temperature conditions around residential areas and living spaces that are close to pollution.

According to NRDC (2005), the primary causes of asthma are air pollutants such as nitrogen oxide, sulfur dioxide, particulate matter, and ground level ozone. When sunshine and oxygen combine with automobile pollution, ozon will form at ground level. Ozone not only causes children to acquire asthma, but it also exacerbates pre-existing asthma. It is known that sulfur dioxide is a respiratory irritant linked to the start of an asthma attack. The smallest air pollutants are called particulate matter, and they include dust, soot, fly, ash, wood smoke, sulfate aerosols, and diesel exhaust particles. Asthma episodes may result from these tiny particles getting stuck in the lungs.

According to studies, hospitalizations for asthma increased in tandem with increases in airborne particulate matter levels. In addition, nitrogen oxide can combine with other air pollutants to create tiny particles that can make it difficult for individuals to breathe, particularly those who have asthma.

Air pollutants

According to the American Lung Association (2013), the most common and harmful air pollutants are ozone and particle pollution. This is because the air we breathe on a daily basis contains a mixture of minuscule solid and liquid particles known as particulate matter, or particle pollution, which can shorten our lives. We cannot even detect the particles because of their small size; some are much smaller and only visible under an electron microscope. The smallest particles can enter the bloodstream through the lungs, but those smaller than 10 micrometers, or roughly one-seventh of the diameter of a human hair, will become stuck in the lungs.

According to the American Lung Association (2013), individuals who are susceptible to

particulate matter include those who are young, adolescents, adults over 65, those who have lung conditions such as asthma, chronic pulmonary disease, chronic bronchitis, and emphysema, those who have diabetes or heart disease, and those who work or are physically active outside.

People with diabetes are more at risk because cardiovascular disease is a result of particle pollution exposure. The following negative health impacts will result from brief exposure to particle pollution:

- death from respiratory and cardiovascular causes, including strokes;
- increased mortality in infants and young children;
- increased numbers of heart attacks, especially among the elderly and in people with heart conditions;
- inflammation of lung tissue in young, healthy adults;
- increased hospitalization for cardiovascular disease, including strokes and congestive heart failure;
- increased emergency room visits for patients suffering from acute respiratory ailments; x increased hospitalization for asthma among children;
- increased severity of asthma attacks in children. Despite the above deadly affect, breathing daily in particulate pollution (year round exposure) can lead to the following health effects:
- increased hospitalization for asthma attacks for children living near roads with heavy truck or trailer traffic;
- slowed lung function growth in children and teenagers;
- significant damage to the small airways of the lungs;
- increased risk of dying from lung cancer;
- increased risk of death from cardiovascular disease;
- increased risk of lower birth weight and infant mortality

According to the US EPA (2009), fine particle pollution poses major health risks. Both short-term and long-term exposure can result in early death, and it can damage the cardiovascular system by causing heart attacks, strokes, heart disease, and congestive heart failure. Particle pollution is likely to affect the respiratory system, exacerbating inflammation, asthma, and COPD. This harmful air pollution can impair development and reproduction in addition to causing cancer.

Conclusion

The impact of human factors (urbanization) on the environment and human health is the first link in the chain of causality in urban environmental health, which humans must comprehend. Urbanization, traffic, and other human-caused factors are the main causes of environmental and air quality degradation. Human health will be impacted by this motivating factor behind human activity. In conclusion, society must take the required steps to address the issue of air pollution as humans are accountable for the waste that is released into the atmosphere. In addition to harming human health, air pollution also degrades the environment's aesthetics, plants, wildlife, soils, and water quality.

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