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HUMAN HEALTH AND WELL BEING: HUMAN HEALTH EFFECT OF AIR POLLUTION

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ABSTRACT

Air pollution can harm human health, the environment, and cause property damage. various research have proven the connection of air quality and human health. The epidemiology and laboratory studies demonstrated that ambient air pollutants (for example PM, O3, SO2 and NO2) contributed to various respiratory problems including bronchitis, emphysema and asthma. The objective of this paper is to discuss the relationship between the human health and air quality.

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INTRODUCTION

Clean air is what all living humans and animals needs for good health and well-being. However, due to unstoppable urban development, the air is continuously polluted. Urban ambient air is more polluted than overall atmosphere, due to high density of human population and their activities in urban areas; it produces air pollutants with a higher rate as compared to less-developed areas and natural environment.

most cities in developing countries are facing increasing environmental pollution from vehicle emissions, and from industries and domestic heating sources at a level that exceeds the capacity to disperse and dilute emissions to non-harmful exposure levels (UN, 2001). The World Health Organization (WHO) stated that urban air pollution as a critical public health problem, and more than 2 million premature deaths each year can be attributed to the effects of urban outdoor air pollutant and indoor air pollutant (WHO, 2006). However, the consequences of air pollution on public health are measured not only in terms of sickness and death, but also in terms of lost productivity and missed educational and other human development opportunities (UN, 2001). The adverse health effects, such as respiratory morbidity, cardiovascular diseases and mortality, have created a public awareness to the urban air pollution. Evaluations and assessments on health have become more important since they serve as a basis to carry out a reformulation or review on the current air quality standards (Colls & Micallef, 1997). The Clean Air Act of 1970 regarded pollutants, such as sulphur dioxide, carbon monoxide, particulates, volatile hydrocarbons, photochemical oxidants, and lead, to be the greatest threats to human health (Cunnningham et al, 2005). No doubt, these pollutants have the capabilities to threat the human health and environment, and could cause significant damages to properties. As stated by numerous scholars, particle pollution and ground level ozone are at the pinnacle among six other pollutants as the most threatening factors to the human health. The epidemiology and laboratory studies also demonstrated that ambient air pollutants (for example, PM, O3, SO2 and NO2) contributed to various respiratory problems including bronchitis, emphysema and asthma.

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Environmental health

Environmental health has a very strong connection between the human health and healthy environment and it's often due to an imbalance resulting from poor adjustment between the individual and the environment. It focuses on the external factors that cause disease, including elements of the natural, social, cultural, and technological worlds in which we live A disease is an abnormal change in the body's condition that impairs with physical or psychological functions air, water and soil represent the environment as a whole. There are two types of environment: natural and man-made. Natural environment composes of everything that affects an organism during the course of its lifetime, such as air, water, soil, radiation, land, forest, wildlife, flora and fauna etc. From a human perspective, environmental issues involve concerns regarding science, nature, health, employment, profits, politics, ethics and economic. Most social and political decisions are usually made with respect to the political jurisdictions. Environmental problems are not necessarily bound to these artificial, political worlds.

The environment comprises of four segments

Atmosphere, hydrosphere, lithosphere and biosphere. The planetary layer of gases enveloping the Earth is held in its place by gravity . This is the atmosphere, and it is responsible for sustaining life by protecting the planet and its inhabitants from the detrimental ultraviolet rays from the Sun. It also contains life-supporting gases such as oxygen and carbon dioxide for its inhabitants . Ozone is a dangerous pollutant, in the ambient air, but it operates as a protective shield from the ultraviolent radiation rays by the stratosphere.

Air

The atmosphere, or air, is normally composed of 79-percent nitrogen, 20-percent oxygen, and one percent mixture of carbon dioxide, water vapour, and small quantities of several other gases. Most of the atmosphere is held close to the Earth by the gravitational pull. Therefore, the composition of its closest point to the surface of the Earth is thinner .The atmosphere consists of the troposphere, a relatively dense layer of gases closest to the surface of the Earth; stratosphere, more distant with similar but less dense gases, and the ionosphere, composed of ionized gases Just as it contains gaseous components, the atmosphere also holds non-gaseous materials present in the form of solid or liquid particles dispersed into the air, such as aerosols or particulate matter. Sources of aerosols and particulate matter in the environment also stated that, they are often regarded as synonymous with air pollution, although the elements involved like dust, soot, smoke, and salt particles are regularly produced by natural processes such as volcanic activity, forest or grass fires, evaporation and air movement, while normal biological processes create and release spores, pollen grains, bacteria, viruses and a variety of other microscopic particles. The atmosphere is very important because, the atmosphere performs several functions that have allowed humans to survive and develop almost anywhere in the earth's surface Atmosphere provides and maintains the supply of oxygen required for life itself Controls the earth's energy budget through such elements as the ozone layer and the greenhouse effect and its internal circulation, distributes heat and moisture across the earth's surface. Atmosphere has the capacity dispose of waste material or pollutants generated by natural or human activity. As mentioned above, the atmosphere consists of a mix of gases plus liquid and solid particles in proportions that vary in both time and places, but when the atmosphere is unable to rid itself of the material being added to it, the build-up of gases and aerosols causes it to become polluted and this pollution is called as air pollution.

Air pollution : an unwanted destruction of the natural environment by human and naturally induced insults, is a problem facing the present world .Due to the expansion of the world population, the number of people is rapidly growing. It is accepted that pollution is a problem, not for a specific group but for everyone. The environmental pollution includes air, water and land (or soil) pollution. Enger & Smith (2000) stated that pollution as something that people produce in large enough quantities that it interferes with our health or well-being. The contributing factors toward pollution are the size of a population and the development of technology that paves into the methods utilized to develop pollution (Anger & Smith, 2000). In a more practical sense, pollution is a product from the inefficiency of human developed processes. Raw materials extraction, product manufacturing, power necessary for the processes in manufacturing and the products have inherent inefficiencies leading to a considerable amount of waste (pollution) that is no longer of use (Wagner, 1994). Air pollution is physical or chemical changes brought about by natural processes or human activities that result in air quality degradation (Cunningham et al, 2005). The release of large amounts of smoke and other forms of waste into the air caused an unhealthy condition because the pollutants were released faster than they could be absorbed and dispersed by the atmosphere (Anger & Smith, 2000). In referring to history, people have long recognized the existence of atmospheric pollutants,

both natural and human induced (Bodkin & Keller, 2007); Leonardo da Vinci wrote in 1550 that a blue haze formed from materials emitted into the atmosphere from trees. The air pollution is classified into three following types which are the Natural Pollutants, Primary Pollutants and Secondary Pollutants. Natural Pollutants are natural phenomena of pollutants that find their way into the atmosphere. Some examples of the natural pollutants are forest fires started by lightning or dispersal of pollen. This paper will focus to primary pollutants and its affect. Five major types of materials that released directly into the atmosphere in their unmodified forms and in sufficient quantities to pose a health risk are carbon monoxide, hydrocarbons, particulates, sculpture dioxide, and nitrogen compounds (Anger & Smith, 2000). These materials can interacts with one another in the presence of an energy source to form new secondary air pollutants such as ozone, very reactive materials and natural chemicals in the atmosphere.

Sources of primary air pollutants as listed in below:

- Sources of primary air pollutants of Carbon monoxide is Incomplete burning of fossil fuels Tobacco smoke, Hydrocarbons and Incomplete burning of fossil fuels.
- Farming operations ,Construction operations Industrial wastes Building demolition.
- Sulphur dioxide from Burning fossil fuels Smelting ore.
- Nitrogen compounds from Burning fossil fuels.

Health effects of air pollution

Though we have exploited our incredible ability to manipulate the environment, we are beginning to realize that every impact we bring upon the environment also has an impact on us. The analogy of environment and pollution given by Wagner in 1994 was Earth can be compared to a fish bowl. That is, the Earth, like a fish bowl, is a contained environment; what goes in stays in. Pollutants that are emitted or discharged do not disappear, but will remain to impact us. Due to the unstoppable urbanization in this world especially, risk of getting affected by pollution is high. More than 2 million premature deaths each year can be attributed to the effects of urban outdoor air pollution and indoor air pollution (caused by the burning of solid fuels). More than half of this disease burden is borne by the populations of developing countries (WHO, 2006). Heart attacks, respiratory diseases, and lung cancer are all significantly higher in people who breathe dirty air compared to matching groups in cleaner environments (Cunningham, et al 2005). Hundreds of deaths have been directly related to poor air quality in cities. The findings showed that all air pollutants, particularly fine particulate matter (PM2.5 with a diameter of 2.5 micrometers or less), and traffic density reduced the average head circumference of a child at birth and increased risk of low birth weight at term. In the study population, average pollution exposure levels ranged from less than 10 micrograms per cubic meter (10 g/m^3) to almost 30 g/m^3. The researchers estimate that for every increase of 5 g/m^3 in exposure to PM2.5 throughout pregnancy, the risk of low birth weight at term increases by 18% (Lancet, 2013). In referring to Anger & Smith (2000), several hours of exposure to air containing 0.001 percent of carbon monoxide can cause death. This is because CO remains attached to hemoglobin for a long time even with small amounts it tends to accumulate and reduce the blood's oxygen-carrying capacity. In addition, carbon monoxide produced in heavy traffic can cause headaches, drowsiness and blurred vision. Reparable particles that smaller than 2.5 micrometers are among the most dangerous of particulates matter because they can be drawn into the lungs, where they damage respiratory tissues. Asbestos fibers and cigarette smoke are categorized among the most dangerous reparable particles in urban and indoor air because they are carcinogenic The danger is because carcinogen is a substance that can cause cancer.

The most severe health risks from normal exposures are related to particulates. People who suffering from respiratory diseases are the most likely to be affected by air pollutions In addition, not just air pollution can cause health effects, study also shows that air pollution can cause stress to a human being. Study by Sahara et al (2012), stated that environment can affect stress in human beings. Good and healthy environment can cause positive impacts to people as well as unhealthy environment can cause problems and eventually stress. The study shows that bad atmosphere condition (air & temperature) surrounding the living areas and living space which is near to pollution as among the factors of human stress.

The types of health effects experienced by the most common pollutants at elevated levels:

- Pollutant Description Health effects Ozone Colorless gas with slightly sweet odor These gases irritate the airways of the lungs, increasing the symptoms of those suffering from lung diseases, strong irritant, aggravates asthma, causes injury to cells in the respiratory system, coughing, chest discomfort, eye irritation .

- ❖ Very small particles Fine particles can be carried deep into the lungs where they can cause inflammation and a worsening of heart and lung diseases Carbon monoxide Colorless, odorless gas This gas prevents the uptake of oxygen by the blood. This can lead to a significant reduction in the supply of oxygen to the heart, particularly in people suffering from heart disease. Causes headache, fatigue, nausea.

- ❖ Nitrogen Most are colorless and Non-irritating gas may aggravate respiratory infections and symptoms .oxide odorless, NO2 with particles is reddish-brown throat, cough, nasal congestion, and fever), increase the risk of chest cold, bronchitis, and pneumonia in children.

- ❖ Sculpture dioxide Colorless, odorless gas Increase in chronic respiratory disease, shortness of breath, narrowing of airways for people with asthma Lead Heavy metal Children most at risk; brain damage, behavior problems, nerve disorders.

Adapted from Defray (2013) and Bodkin & Keller (2007) NRDC (2005), listed air pollutants of ground level ozone, sulfur dioxide, particulate matter and nitrogen oxide as the main factors contributing to asthma. Ozone will occur at ground level when pollution from vehicles reacts with oxygen and sunlight. Not just ozone will lead to the development of asthma in children but it will also makes existing asthma worse. Sulfur dioxide is recognized as a respiratory irritant associated with the onset of asthma attack. Particulate matter are the finest air pollutant synonyms with tiny particles in the air with the shape of dust, soot, fly, ash, wood smoke, sulfate aerosols and diesel exhaust particles. These fine particles can become lodge in the lungs and could trigger asthma attacks. Studies shown the number of hospitalizations for asthma increases when levels of particulate matter in the air rise. Other than that, nitrogen oxide can reacts with other air pollutants and form small particles that can cause breathing difficulties especially in people with asthma.

The most widespread air pollutants.

(a) Air pollution remains a major danger to the health of children and adults Source:

- ❖ American Lung Association (2013) American Lung Association (2013) emphasized that ozone and particle pollution are the most widespread air pollutants and the most dangerous

- ❖ This is because particulate matter or particle pollution is a mix of very tiny solid and liquid particles in the air we breathe daily and it can shorten our life. The tiny size of the particles make it widespread and everywhere, we cannot even see it, and some are tinier and can only be seen with an electron microscope.
- ❖ Particles that are smaller than 10 micrometers in diameter or about 1/7 the diameter of a single human hair will get trapped in the lungs while the smallest can pass through lungs into the blood stream.

(b) Size of particulate matter Source:
American Lung Association (2013) As listed by the American Lung Association (2013), people that are at risk of particulate matter are infants, children and teens, people over 65 years old, people with lung disease (asthma, chronic pulmonary disease, chronic bronchitis and emphysema), people with heart disease or diabetes and people who work and active outdoors. For diabetic people the risk is higher because exposure to particulate pollution will lead to cardiovascular disease.

Short term exposure to particle pollution will lead to following health effects:

- ✓ 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 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 US EPA (2009), conclude that fine particle pollution lead to serious health threats. It can causes early death (both short-term and long-term exposure), causes cardiovascular harm such as heart attack, strokes, heart disease, congestive heart failure. Particle pollution likely to cause respiratory harm that will make the asthma, COPD and inflammation getting worse. This deadly air pollutant may cause cancer and may cause reproductive and developmental harm.

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