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ENVIRONMENTAL POLLUTION AND ITS EFFECT ON HUMAN HEALTH

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Abstract: Exposure to environmental pollution is a major source of health risk throughout the world. These health risks are higher in developing countries, where poverty, less use of modern technology and weak environmental legislation combine to cause high pollution levels. Association between environmental pollution and health outcome are, however complex and often poorly characterized. Human health may be affected in many ways by an individual pollutant. Long latency times, the effects of cumulative exposures and multiple exposures to different pollutants which might act synergistically all create difficulties in unraveling associations between environmental pollution and health. About 8-9% of the illness may be due to pollution considerably more in developing countries (David Briggs 2003). Unsafe water, poor sanitation and poor hygiene are seen to be the major sources of exposure, along with indoor air pollution.

Index Terms - Environmental pollution, health, pollutants, DALYs

I. INTRODUCTION

Global development, continuing industrialization and rapid increase in world population during the 20th century, has been a great contributor to several global issues; environmental changes include also major global issues such as climate change, ozone depletion, changes in ecosystems, decreased biodiversity, depletion of natural resources and land degradation. As the population grows and consumption increases, these changes continue to threaten the health and wellbeing of humankind. As human activities have a direct impact on the environment, leading to several serious problems such as increase of outdoor and indoor pollution, increase of greenhouse gases. These environmental issues cause a negative impact on human health. Pollution is the major problem and continuing risks to health. These problems are greater in the developing countries, where traditional sources of pollution such as industrial effluents, poor sanitation, inadequate waste management, contaminated supplies and exposures of indoor air pollution from biomass fuels effect large numbers of people. In recent decades a wide range of modern pollutants emerged such as use of chemicals in home, in food, for water treatment and for pest control. The large number of people exposed to environmental pollution nevertheless means that even small increase in relative risk can add up to major public health concern. As the impact of human activities and issues of environmental health become increasingly global in scale and extend, the need to recognize and to address the health risks associated with environmental pollution becomes even more urgent. Environmental issues are one of the primary causes of disease, health issues and long term livelihood impact also for India. India is third largest emitter of CO₂ in the world from fossil fuel combustion and from industrial processes behind China and USA (Oliver *et al* 2015). Half of the top twenty most polluted cities in the world are in India (WHO 2016) and India is ranked the third worst of 180 countries for particular matter (PM_{2.5}) exposure (Hsu *et al* 2016). Effective action, however, requires an understanding not only of the magnitude of the problem, but also its causes and underlying processes, for only then can intervention be targeted at where it is most needed and likely to have greatest effect.

II. Major causes of Environmental Pollution:

1. Population growth:

There is a long history of study and debate about the interactions between population growth and the environment. A growing population exerts pressure on agricultural land, causing environmental degradation, and forcing the cultivation of land of higher as well as poorer quality. This environmental degradation ultimately reduces agricultural yields and food availability, famines and diseases. Population growth can increase pressure on the assimilative capacity of the environment and also is a major cause of air, water and solid-waste pollution. There is no question that population growth may contribute to environmental degradation; its effects can be modified by economic growth and modern technology (Antony 2002). Other data suggest that population density has little correlation to environmental quality and human quality of life. Many countries with higher population density enjoy environmental quality as well as human quality of life far superior than India as Singapore, Hong Kong, South Korea and Netherland etc.

2. Water pollutants:

Discharge of untreated sewage is an important cause for pollution of surface and ground water in India. Due to lack of treatment capacity and poor maintenance of treatment plants the problem become more serious. The uncollected waste accumulates in urban areas, causing unhygienic conditions and releasing pollutants that reach to surface and ground water. According to a WHO (1992) study only 209 cities and towns had partial sewage treatment facilities, and only 8 cities have full wastewater treatment facilities. Over 100 Indian cities dump untreated sewage directly into the Ganges River (NGS, 1995). Investment is needed to bridge the gap between 29000 million litres per day of sewage India generates, and a treatment capacity of mere 6000 million litres per day (CPCB, Govt. of India, 2005). Other sources of water pollution are small scale factories along the rivers and use of pesticides and fertilizers in agriculture.

3. Air pollutants:

The major source of air pollution is biomass burning, fuel adulteration, vehicle emission, and traffic congestion. India is the world's largest consumer of fuel wood, agricultural waste, and biomass for energy purposes. Fuel wood, agricultural waste and biomass cake burning release over 165 million tons of combustion products every year (Ganguly *et al*, 2001, D. Pennise *et al*, 2012). These biomass-based household stoves in India are also a leading source of greenhouse emissions, which contribute to climate change. The annual crop burning practices in northwest India is a major source of air pollution. Crop residues are burnt in the open, releasing NO_x, SO_x, PAHs and particulate matter into the air. Vehicle emissions are another source of air pollution. Vehicle emissions are worsened by fuel adulteration and poor fuel combustion efficiencies from traffic congestion and low density of quality, high speed road network per 1000 people (The World Bank 2002, India Today 2010). In order to reduce air pollution effects India is introducing hybrid and electric vehicles as per the faster adoption and manufacturing of electric vehicles in India scheme. The air (Prevention and Control of Pollution) Act was passed in 1981 to regulate air pollution and there have been some measurable improvements (The World Bank 2011, 2012). However, the 2012 Environmental Performance Index ranked India at 177th position out of 180 countries in 2018, as having the poorest relative air quality out of 132 countries.

4. Solid waste pollutants:

Trash and garbage are major source of pollution. Indian cities alone generate more than 100 million tons of solid waste a year. Street corners are piled with trash. Public places and sidewalks are despoiled with filth and litter, rivers and canals act as garbage dumps. India's waste problem also points to a stunning failure of governance (The New York Times 2010). The Organization for Economic Cooperation and Development estimates that up to 40 percent of municipal waste in India remains simply uncollected. Even medical waste, theoretically controlled by stringent rules that require hospitals to operate incinerators, is routinely dumped with regular municipal garbage. A recent study found that about half of India's medical waste is improperly disposed.

5. Noise pollution:

Excessive noise may harm the activity or balance of human or animal life. The source most outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles, aircraft, and trains. In India the outdoor noise is also caused by loud music during festival seasons. Poor urban planning may give rise to noise pollution, since side-by-side industrial and residential buildings can result in noise pollution in the residential areas. Indoor noise pollution can be caused by machines, building activities, and music performance, especially in some workplaces. Noise-induced hearing loss can be caused by outside or inside

noise. High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease (BSI -2016). In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss. In January 2010, Government of India published norms of permissible noise levels in urban and rural areas (Govt. of India 2010).

6. Green house gas emission:

India was the third largest emitter of carbon dioxide, a major greenhouse gas, in 2009 at 1.65Gt per year, after China and the United States. With 17 percent of world population, India contributed some 5 percent of human sourced carbon dioxide emission; compared to China's 24 percent share. On per capita basis, India emitted about 1.4 tons of carbon dioxide per person, and a world average of 5.3 tons per person.

III. The Contribution of Environmental Pollution to Global Burden of Disease:

i. Environmental health impacts

In 2016 about 24% of all deaths worldwide were attributed to the environment. Air pollution, water and sanitation, increasing heat waves and severe weather events, harmful exposure to chemicals etc are responsible factors. The estimation of the burden of disease from environmental factors relies on information about relationships of exposure and its response. Understanding how much disease and ill health can be attributed to modifiable environmental risks can contribute to identifying opportunities for prevention and should add impetus to global efforts to encourage sound preventive measures through available policies, strategies, interventions, technologies and knowledge.

WHO combines expertise and evidence to estimate the environmental burden of disease, which quantifies the amount of disease caused by environmental risks. For example, WHO produces internationally comparable estimates on population exposure globally, including working with UNICEF on water and sanitation estimates through the Joint Monitoring program for water supply, sanitation and hygiene, and global databases on air pollution. WHO also coordinates the development of exposure-response relationships, such as the regular updates of systematic analyses of the impacts of drinking water, sanitation and hygiene on health. This type of information is then combined to estimate the global burden of disease of various environmental risks to health.

ii. Effects of air pollution on the human health

Air pollution is now the world's leading environmental health issue, claiming 7 million lives each year. In addition to outdoor air pollution, indoor air pollution is also severe health risk for some 26 billion people. It is one of the biggest environmental health problems affecting everyone in both developed and developing countries. Development of industrialization along with over population and urbanization has led to hazardous level of air quality. A recent study by World Air Quality Report highlights how dangerous high air pollution levels can be approximately about a 3 to 4% of global gross domestic product goes towards fixing problems related to inhaling toxic fumes day after day without any relief coming soon enough. As per this report, 35 Indian towns had the worst air quality in 2021.

Like natural disasters, climate change as a subsequent of environmental pollution can potentially affects the geographical distribution of various virulent diseases. The great protest over climate change has focused attention on the role that air pollution plays in causing illness. Particles with smaller diameters that enter your respiratory system can cause various health problems, including cancer. In a recent survey by WHO, 99% of the world's population breathes unhealthy air. Over recent years therefore many attempts have been made to assess the population, both nationally and globally, and to deduce the contribution made by pollution and other environmental factors.

iii. The environmental burden of disease

It is too little known either about the causal links between environmental pollution and health or about the levels of exposure across the population, to make reliable assessments of the proportion of disease or mortality attributable to pollution. These difficulties are severe in developed countries, where disease surveillance, reporting of mortality, environmental monitoring and population data are all relatively well established. In most developing countries they become all but insurmountable, because of the generally impoverished state of routine monitoring and reporting. Controls on emissions and exposures in the developing world are often limited so that risks from environmental pollution are likely to be greatest. Such

uncertainties thus render any attempt to quantify the environmental burden of disease highly approximate at best. Two main approaches have been proposed for disease attribution (Mathers *et al*, 2002). Categorical attribution assigns each death to a specific disease or risk factor, according to a defined set of rules (*e.g.* the ICD system). The advantage of this approach is that it is relatively straightforward and consistent, and avoids double-counting; the disadvantage is that it ignores the multi-factorial nature of many diseases and still leaves unresolved the problem of how to define appropriate rules. Counterfactual attribution involves comparing the current level of disease or mortality with that which might be expected to occur in the absence of the risk factor (or at some other reference level). One of the main difficulties with this approach is how to define this reference level. Several possibilities exist: for example, the complete absence of the risk factor, the level of risk in some reference population or area, or the achievable level of risk with current technologies. Each will tend to give a rather different measure of the attributable burden of disease. In this context, another difficulty also arises, *i.e.* how to assess the likely change in disease burden under the selected scenario, in the absence of empirical data. Notwithstanding these difficulties, a revised assessment of the global burden of disease has recently been carried out, involving explicit attempts at attribution by risk factor or hazard (Ezzati *et al*, 2002). A counterfactual approach was used, with the reference level for each disease being defined as that which would occur under conditions of a minimum theoretical exposure distribution (*i.e.* that which would achieve the lowest population risk, irrespective of whether this is achievable in practice). Results from assessment for a number of environmental risk factors are summarized in Table 1.

S. No.	Risk Factors	Deaths		DALYs	
		Number	%	Number	%
1	All risk factors	55861		1455473	
2	Water, sanitation and hygiene	1730	3.1	54158	3.7
3	Urban outdoor air pollution	799	1.4	6404	0.4
4	Indoor smoke from solid fuels	1619	2.9	38539	2.6
5	Lead	234	0.4	12926	0.9
6	Occupational carcinogens	118	0.2	1183	0.1
7	Occupational air borne particulates	356	0.6	5354	0.4
8	Occupational noise	0	0.0	4151	0.3
9	Total	4856	8.7	122715	8.4

Table 1 Global burden of disease (thousand and percent) attributable to selected sources of environmental and occupational pollution

The sources of environmental and occupational pollution listed in Table 1 account for 8–9% of the total global burden of disease, measured either in terms of mortality or DALYs (disability adjusted life years). Amongst these risk factors, water, sanitation and hygiene and indoor air pollution are seen to be the most important; health effects of outdoor air pollution are comparatively small. A range of other sources of pollution might be implicated in the global burden of disease, such as exposures to ionizing and non-ionizing radiation, food contamination, pesticides, household hazardous chemicals, wastes and other forms of indoor air pollution. The overall burden of disease attributable to pollution, therefore, cannot yet be assessed. As with previous estimates of the burden of disease, marked variations can also be recognized between different parts of the world. As is to be expected, the developing countries bear the major proportion of the burden. Problems of unsafe water, sanitation and hygiene, for example, account for an estimated 6.6% of DALYs in Africa, and 4.7% in south-east Asia, compared with 0.5% in Europe. Indoor air pollution accounts for 4.4% of DALYs in Africa and 3.6% in south-east Asia, compared to 0.4% in Europe. Risks attributable to environmental pollution in the developing world are thus 15–35 or more times greater than in developed countries.

Conclusion

The links between environmental pollution and health in existing environmental information and estimates of exposure is very difficult. However, environmental pollution plays a significant role in a number of health outcomes and in many cases this adds up to a serious public health concern. Water pollution, sanitation and hygiene, indoor air pollution, and to a lesser extent outdoor air pollution and exposures to chemicals in both the indoor and outdoor environment are all important risk factors in this respect. Ionizing and non-ionizing radiation and noise are also causes for concern in many cases. Secondly, it is clear that the distribution of risks from these factors is not equal across the world. The developed world is not risk-free, but the developing world is far more severely affected by pollution, and in many instances becoming more so, as pressures from development add to traditional sources of exposure and risk. More research is undoubtedly needed on a range of emerging environmental health issues. But the deficit of action that has allowed environmental pollution still to take its toll on health derives not so much from failures in science or technology as from the lack of political will and economic empowerment.

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