An Eye on Environmental Pollution : Do We Care ?

Md. Ali Hossain[1], Md. Rashidul Hassan[2], Kazi Saifuddin Bennoor[3]

Definition :

Environmental pollution is considered when there develops an increase in concentration of gases or particles to levels above those generally accepted as normal[1].

There are no statistics of air quality standards in our country. The following table shows national primary air quality standards of United States.

National Primary Air Quality Standards (United States) :[2]

Pollutant	Standasrd	Average period
Total suspended particles	260µg/m^3	24 hours
	75 µg/m^3	1 year
Sulfur dioxide	0.14 ppm	24 horus
	0.03 ppm	1 year
Nitrogen dioxide	0.05 ppm	1 year
Ozone	0.12 ppm	1 hour
Carbon monoxide	35 ppm	1 hour
	9 ppm	8 hours
Lead	1.5 µg/m^3	1 month

Common respiratory diseases caused by environmental pollution includes :

1. Chronic obstructive pulmonary disease

2. Bronchial Asthma

3. Bronchogenic Carcinoma

4. Miscellaneous :

   - Respiratory tract infection

   - pulmonary edema

   - Mesotthelioma

Three major types of air pollution are recognised :[3]

- Sulfur dioxide & particulate complex

- Photochemical oxidants

- Miscellaneous category of pollutants arising from industrial sources

Sulfur dioxides, ozone, & nitrogen dioxide are the three most widely encountered pollutants that have been shown to cause adverse pulmonary effects.

	Major Sources
Sulfur dioxides	→ Power plants,oil refineries, industries
Ozone and nitrogen oxides	→ Produced by the action of sunlight on the waste products and of the internal combustion of engine

Sulfur dioxides is effectively absorbed by the mucosal surfaces of the upper airways. A very small portion of the sulfur dioxide reaches the distal regions of the lungs[4].

Ozone and nitrogen dioxide are relatively insoluble and poorly absorbed by the upper airways. A high proportion of the dose inhaled thus reaches the peripheral portion of the lung and can cause injury at any site from the upper airways to the alveoli[5].

In urban area outdoor and indoor air pollution is different. Urban residents typically spend 90% of their time indoors[6]. Now-a-days, pollution of indoor environment, which is also termed as "Micro environment[4], has become a mejor point of concern[7].The following table shows the difference between outdoor and indoor air pollution in urban area :

Outdoor urban air	Indoor
• Polycyclic hydrocarbons	• Cigarette smoking
• N-nitroso compounds	• Nitrogen dioxide (natural gas, Kerosine)
• Asbestos	• Formaldehyde (urea formaldehyde foam insulation)

Effects of pollutants in respiratory tract :

• Sulfur dioxide	→ Bronchoconstriction[8]
• Photochemical Oxidant	→ Pulmonary edema[2]
• Ozone	→ Cough, substernal discomfort, decrease in FEV_1 and FVC, rise in airway resistance, fall in lung compliance.
• No$_2$	→ Increased chance of Respiratory tract infection[10].

In addition to direct effects in respiratory tract, air pollution has indirect effects on environment. These includes

- Global Warming
- Ozone Depletion
- Biological Diversity Loss
- Deforestation
- Desertification
- Global Warming

It is generally accepted that the continuing build up of the green house gases in the atmosphere will lead to substantial global warming. By the year 2025, there is likely to be an increase in global mean temperature of 1°C above the present value. Using computer models scientists have predicted the potential degree of warming.

The predicted increase in global temperature would have a considerable impact on the environment and on society. One of the principal effects would be the overall rise in the sea-level due to the melting of the ice caps and expansion of the oceans. This will threaten low-lying costal lands which are agriculturally productive, density populated and containing major urban settlements. The increase of global temperature, would result in a change in the present world pattern of winds and rainfall, and this would affect the global distribution of forests and farming system.

It is possible that as a result of global warming there will be a greater frequency of weather related extremes like floods, draught and storm.

Ozone Depletion

The ozone layer is found at an altitude of 20-25 kilometers in the stratosphere and it keeps out most of the sun's harmful ultraviolet radiation. The threat to the ozone layer is the presence of chloroflurocarbon (CFC) in the atmosphere.

Continued depletion of the ozone layer would result in an increase in ultraviolet radiation which would lead to a rise in the occurrence of skin cancers and cataracts. Agriculture would also be affected. Ultraviolet radiation penetration deeply into clear water would affect fish supplies. This radiation can also cause deterioration of synthetic material such as paints and other products used in the building industry.

To stop ozone depletion, the products emitting CFCs into the atmosphere should be replaced with alternative.

Biological Diversity loss

The term biological diversity refers to the variety of life forms found on this planet, that is; the number of species, the genetic diversity within the species and the different ecosystems which they form. Human beings are dependent on other forms of life around them for their food, clothes, shelter, health, medicine, oxygen and other factors. The continuity of all the lifeforms including man is dependent on the existence of a rich biological diversity. Loss of this richness endangers the existence of all life forms, including man.

The loss of biological diversity is mainly caused by the destruction of habitats, as land is cleared for farming, industral development and so on. Pollution is a further signficant cause. The effects of acid rain on trees and acidification of rivers and lakes are also serious problem. Exploitation of species by human kind through such activities as hunting, fishing, lumbering can lead to their reduction and even extinction.

Deforestation

The clearing of forest is not a recent activity. Timber has played a vital part in the development of human kind, providing a basic resource for fuel, building material, tools and equipment. Most of the world's temperature deciduous forests have been replaced by agricultural lands. It is estimated that every year 6.3 million hectares of tropical forests are cleared for agriculture and 4.4% million hectares are degraded for logging, these figures exceed the rate of reforestation.

Desertification

Desertification is the process where by lands bordering true deserts are reduced to desert like conditions.

The underlying cause of desertification is the detrimental effect on the vegetal cover mainly as a result of inappropriate farming practices. In some cases, cultivation methods lead to overcropping on the arid soil which soon become exhausted. Unplanned control of flow review also caused desertification.

Morbidity and mortality from environmental pollution :

1. 40% of deaths world wide are caused by pollution and other environmental factors.

2. Each year air pollutants adversely affect the health of 4-5 billion people and the trend looks like to worsen with the number of automobiles growing three times faster than the rate of population growth.

3. Smoke from indoor cooking fires that burn wood and dung is estimated to kill four million children each year.

4. Lack of sanitary conditions contribute to four million deaths world wide each year mostly among infants and young children in developing countries.

Strategies for Control of Air Pollution

The present day environment crisis demands a change in attitude in order that initiatives can be taken to rescue the environment from destruction. Industrialized nations have a big share in the present day environment problems.

In developing countries, environmental protection is still a luxury they can hardly afford. Some are finally becoming aware of the environment abuse, but large population, pollution unplanned industrialization and foreign debts have kept them off the environment conservation process.

Elimination of air pollution is an unrealistic or impossible goal.

So measures needed to identify the nature and source of the specific pollutants responsible and development of measures to reduce their production and dispersal.

There are ways to prevent environmental pollution :

1. Primary prevention
2. Secondary prevention
3. Tertiary prevention

Primary Prevention :

Primary prevention means abrogating the risk factor before illness strikes. It is include banning of certain hazards, for example, structural asbestos spraying).

Secondary prevention :

The pulmonary clinician is more frequently faced with opportunities for secondary than primary preventive interventions. Here patient is identified and action is taken thus preventing further deterioration. Another no less important aspect of secondary prevention is the identification of others at risk owing to similar exposures.

Tertiary prevention :

Activities that attempt to slow progression or prevent anticipated complications of previous exposure or of disease that is already established, e.g. smoking cessation among asbestos workers. Tueberculosis prophylaxis among silicatics.

Conclusion :

Environmental pollution comprise an important and challenging topic in respiratory medicine. Their diagnosis, treatment and most prominently their prevention have major public health implications.

The present day environment crisis demands a change in attitude in order that initiatives can be taken to rescue the environment from destruction. Industrialized nations have a big share in the present day environment problems.

The situation may improve only when people realise that there are certain rules that they must go by to protect the environment. In UK the ''British Clean Air Act" was introduced in 1956. In the United States, a similiar low was adopted in 1970[11].

The air pollution level over Dhaka has reached a frightening level. Study conducted in 1997 indicates the air pollution level is clearly above the danger mark and is related to morbidity from asthma. It shows that the concentration of suspended particulate matter is 3-4 times higher than the maximum acceptable level in Dhaka during January to March 2. Now it is time for actively thinking of introducing an effective regulation against environmental pollution in Bangladesh.

Without control of environmental pollution, present situation will be worse in near future and will push the world towards a corner, making the proposition uncertain whether or not it will remain habitable for coming generations.

Ecologist have concluded 'life on earth killing us."

References :

1. Guentar CA, Welch MH. Pulmonary Medicine, Philadephia JB Lippincott, 1997 : 22.

2. Ozhayaak H, Thurston DG. Association between 1980 US Mortality rates and alternative measures of airborne particular concentration. Risk anal 1987; 4 : 449-61.

3. Boushey HA, Sheppard D, Tager I. Air pollution. In : Text Book of Respiratory Medicine 2nd Ed Philadelphia, WB Saunders 1994; 12 : 2032-49.

4. Frank NR, Yoder RE, Brain JD, Yokoyama E. SO2 absorption by the nose and mouth under conditions of varying concentration and flow. Arch. Environ. Health 1969; 18 : 315-22.

5. Haagen Smith AJ, Wayne LG. Ozone formation in photochemical oxidation of organic substances. Ind. Engin. Chem 1956; 48 : 1984-90.

6. Spengler JD, Sexton K. Indoor air pollution. A public health prospective science 1983; 221 : 9-17.

7. Samet JM, Marbury MC, Spenger JD. Heath effects and sources of indoor pollution. Am Rev Respir Dis 1987; Part I-136 : 1486-508, Part II 137: 221-42.

8. Frank NR, Amder MO, Morcester J. Whittenberger JH. Effects of acute controlled exposure to SO2 on respiratory mechanics in health male adults. J Apple physiol 1962; 17 : 252-8.

9. Lippman M, Kioy PJ, Leikauf G et al. Effects of ozone on the pulmonary function of children. Adv. Environ Toxicol 1983; 5 : 4-46.

10. Same JM, Nitrogen Dioxide and respirations infection. Am Rev Respir Dis 1989; 139 : 1073-4.

11. Shy Cm. Review and commentary : Epidemiologic evidence and the United States air quality standards. Am J Epidemiol 1979; 1110 : 661-71.

12. Ahmed T, Roy AK, Biswas J, Halder S, Islam SMR. RAir pollution in Dhaka, Bangladesh and asthma morbidity. Lancet. The challenge of asthma conferene. Tours, France; 1997; 61.