

## CHAPTER – 2 Social Pharmacy

### Topic: POLLUTION

#### 2.1

#### INTRODUCTION

“Pollution is the introduction of substances (or energy) that cause adverse changes in the environment and living entities.” Pollution need not always be caused by chemical substances such as particulates (like smoke and dust). Forms of energy such as sound, heat or light can also cause pollution. These substances that cause pollution are called **pollutants**. Pollutants can make their way up the food chain and eventually find their way inside the human body. Any environmental/natural disturbances create by the Physical, chemical, and biological resources are called as pollutions.

Pollution is any undesirable change in physical, chemical or biological characteristics of air, land, water or soil. In order to control environmental pollution, the Government of India has passed the Environment (Protection) Act, 1986 to protect and improve the quality of our environment (air, water and soil).

#### 2.2

#### TYPES OF POLLUTION

On the basis of sources many types of pollution given below—

- ❖ Water pollution.
- ❖ Noise pollution.
- ❖ Air pollution.
- ❖ Soil pollution.
- ❖ Plastic pollution.
- ❖ Radioactive pollution.

#### 2.3

#### WATER POLLUTION

Water pollution is said to occur when toxic pollutants and particulate matter are introduced into water bodies such as lakes, rivers and seas. These contaminants are generally introduced by human activities like improper sewage treatment and oil spills. However, even natural processes such as eutrophication can cause water pollution. Any undesirable changes in the water properties by physical, chemical and biological method is called as water pollution. Realizing the importance of maintaining the cleanliness of the water bodies, the Government of India has passed the Water (Prevention and Control of Pollution) Act, 1974 to safeguard our water resources.

## 2.4

**SOURCES OF WATER POLLUTION**

- + Dumping solid wastes in water bodies.
- + Disposing untreated industrial sewage into water bodies.
- + Human and animal wastes.
- + Agricultural runoff containing pesticides and fertilisers.
- + High amount uses of detergent and soap are also contaminate the water.
- + Industry is one of the sources of water pollution by draining the wastes material into the river or in water sources.
- + Accidental oil leakage is also contaminating the water.
- + Acidic rain is also a one of the sources which caused the water pollution.
- + Some human activities like, cloth cleaning, animal bath in river are water sources are also cause the pollution.

## 2.5

**Effects on health of water pollution/water born disease**

- Disruption of the ecosystem.
- Threats to marine life.
- Increased risk of water-borne diseases.
- Increases toxic chemicals (such as mercury) in water bodies Eutrophication.
- Polluted water causes the metabolism defect in the body and produce the many disease like Gastroenteritis, Diarrhea, Cholera, dysentery.
- Polluted water also effects the brain activity and can cause brain related severe problem.
- Many infectious diseases agent transfer from one place to another through flowing of contaminated water like- Typhoid, Giardiasis, Amoebiasis, Ascariasis, Hookworm.
- Polluted water effects the normal growth and development and also induced the infant mortality.
- Polluted water can cause the impotency in both male and female.
- Due to the pollution BOD are increases so oxygen contents are low in water sources and water animals face many problems.
- Due to the pollution water harms the many organs and causes the serious problem. Kidney disease, heart disease, lungs disease, etc.

## 2.6

## Treatment of water pollution

They waste water potable and usable by employing wastewater treatment technologies that filter and treat the wastewater by removing contamination such as sewage and chemicals. Four common ways to treat the water.

- ❖ **Physical treatment**— In this method are used for cleaning the waste water processes like screening, sedimentation and skimming are used to remove the solids no chemical are involved in this process.

The main techniques of physical waste water treatment including sedimentation which is a process of suspending the heavy particles from the waste water.

- ❖ **Chemical treatment**— the use of chemicals in water chlorine an oxidising chemical is commonly used to kill bacteria which decomposes water by adding contaminate to it. Another oxidizing agent used for purifying the waste water is Ozone.

Neutralization is a technique where an acid or base is added to bring the water to its natural pH of 7 chemicals prevents the bacteria from reproducing in water thus making the water pure.

- ❖ **Biological treatment**— this use various biological processes to break down the organic matter present in wastewater such as soap, human waste oil and food etc. It can be divided into three categories.

- **Aerobic processes**— Bacteria decomposes the organic matter and converts it into carbon dioxide that can be used by plants. Oxygen is used in this process.
- **Anaerobic Processes**— Here fermentation is used for fermenting the waste at a specific temperature. Oxygen is not used in anaerobic process
- **Composting**— A type of Aerobic process where wastewater is treated by mixing it with sawdust or other carbon sources.

- ❖ **Sludge treatment**— This is a solid liquid separation process where the least possible residual moisture is required in the solid phase and the lowest possible solid particles residuals are required in the separated liquid phase.

## 2.7

## Importance of safe drinking water

- Water which is suitable for drinking is called potable water.
- Due to use of clean and safe water we always will be safe from disease.
- Due to the safe water drinking, metabolism activity performs properly, then you will always be healthy.
- We always away from infectious disease and water borne diseases.

**2.8****AIR POLLUTION**

Air pollution refers to the release of harmful contaminants (chemicals, toxic gases, particulates, biological molecules, etc.) into the earth's atmosphere. These contaminants are quite detrimental and in some cases, pose serious health issues. Some causes that contribute to air pollution are:

- Burning fossil fuels
- Mining operations
- Exhaust gases from industries and factories

The effects of air pollution vary based on the kind of pollutant. When air is contaminated by unwanted substances which have a harmful effect on both the living and the non-living, it is referred to as airpollution. Air consists of a mixture of gases. By volume, about 78% of this mixture is nitrogen and about 21% is oxygen. Carbon dioxide, argon, methane, ozone and water vapors are also present in very small quantities. According to Central Pollution Control Board (CPCB), particulate size 2.5 micrometers or less in diameter (PM 2.5) are responsible for causing the greatest harm to human health.

**2.9****Source of Air Pollution**

The substances which contaminate the air are called air pollutants. Sometimes, such substances may come from natural sources like smoke and dust arising from forestfires or volcanic eruptions. Pollutants are also added to the atmosphere by certain human activities.

The sources of air pollutants are:

1. Automobile exhausts
2. Burning of firewood and dung cakes.
3. Factories
4. Power plants
5. Smog is also an air pollution which is made up of smoke and fog. Smoke may contain oxides of nitrogen which combine with other air pollutants and fog to form smog. The smog causes breathing difficulties such as asthma, cough and wheezing in children.
6. Chlorofluorocarbons (CFCs) which are used in refrigerators, air conditioners and aerosol sprays. CFCs damage the ozone layer of the atmosphere it is also behaves as air pollution.

**2.10****Effect on health of Air Pollution**

- A. Air pollution cause serious health disease for long term, Heart disease, lung cancer, and respiratory diseases such as emphysema etc.

- B. Air pollution can also cause long-term damage to people's nerves, brain, kidneys, liver, and other organs some time it causes the birth effects.
- C. **Acid Rain:** — Acidic rain is damages the monuments like 'Taj Mahal'. Pollutant like sulphur dioxide and nitrogen dioxide gases react with the water vapors present in the atmosphere to form sulphuric acid and nitric acid. The acids drop down with rain, making the acidic rain. This is called acid rain.
- D. **Depletion of the Ozone Layer:** — CFCs are major cause of Ozone layer depletion.
- E. **Green house effect:** — Sunlight is the essential source of energy. During sunlight clouds and gases reflect about one-fourth of the incoming solar radiation, and absorb some of it but almost half of incoming solar radiation falls on Earth's surface heating it, while a small proportion is reflected back earth's surface re-emits heat in the form of infrared radiation but part of this does not escape into space as atmospheric gases (e.g., carbon dioxide, methane, etc.) absorb a major fraction of it.

The molecules of these gases radiate heat energy. This cycle repeated many times and causes the green house effects. Increase in the level of greenhouse gases has led to considerable heating of earth leading to global warming. Green house gases mainly —

- ❖ CO<sub>2</sub> (60%),
- ❖ CH<sub>4</sub> (20%),
- ❖ CFCs (14%),
- ❖ N<sub>2</sub>O (6%).

## 2.11

### Control of Air Pollution

Smokestacks of thermal power plants, smelters and other industries release particulate and gaseous air pollutants together with harmless gases, such as nitrogen, oxygen, etc. These pollutants must be separated/ filtered out before releasing the harmless gases into the atmosphere. There are several ways of removing particulate matter, the most widely used—

- Scrubber
- Electrostatic precipitator.

For prevention of air pollution many country are used CNG and LPG for vehicles or automobiles.

## 2.12

**NOISE POLLUTION**

Noise pollution refers to the excessive amount of noise in the surrounding that disrupts the natural balance. Usually, it is man-made, though certain natural calamities like volcanoes can contribute to noise pollution. In general, any sound which is over 85 decibels is considered to be detrimental. Also, the duration an individual is exposed plays an impact on their health. For perspective, a normal conversation is around 60 decibels, and a jet taking off is around 150 decibels. Consequently, noise pollution is more obvious than the other types of pollution. Noise pollution has several contributors, which include, Noise is undesired high level of sound. We have got used to associating loud sounds with pleasure and entertainment not realizing that noise causes psychological and physiological disorders in humans.

In India, the Air (Prevention and Control of Pollution) Act came into force in 1981, but was amended in 1987 to include noise as an air pollutant.

## 2.13

**Source of Noise Pollution**

- Industry-oriented noises such as heavy machines, mills, factories, etc.
- Transportation noises from vehicles, aeroplanes, etc.
- Construction noises
- Noise from social events (loudspeakers, firecrackers, etc.)
- Household noises (such as mixers, TV, washing machines, etc.)
- Noise pollution can come from outdoor sources, such as road traffic, jet planes, garbage trucks, construction equipment.
- Some of the main sources of noise in residential areas include loud music, transportation (traffic, rail, airplanes, etc.), lawn care maintenance, construction, electrical generators, wind turbines, explosions

## 2.14

**Effects on health of Noise Pollution**

- Long term exposure of loud sound it caused the Noise Induced Hearing Loss (NIHL).
- It also induced the sleeping disorder due to listening of sound long term.
- Exposure to loud noise can also cause high blood pressure, heart disease, and stress.
- Trouble Communicating is the major problem due to high loud noise.
- Hearing system is also control our balancing system so high frequency sound can cause disturbance.
- It is also cause many brain related problem.

## 2.15

**Control of Noise Pollution**

- Reduction of noise in our industries can be affected by use of sound absorbent materials or by muffling noise.
- A man inserting an earplug in his ear to reduce the noise exposure.
- Permissible sound-levels of crackers and of loudspeakers, timings after which loudspeakers cannot be played, etc need to be enforced to protect ourselves from noise pollution.

## 2.16

**SEWAGE & SOLID WASTE DISPOSAL**

Municipal solid wastes are wastes from homes, offices, stores, schools, hospitals, etc., that are collected and disposed by the municipality. The municipal solid wastes generally comprise paper, food wastes, plastics, glass, metals, rubber, leather, textile, etc.

Burning reduces the volume of the wastes, although it is generally not burnt to completion and open dumps often serve as the breeding ground for rats and flies. Sanitary landfills were adopted as the substitute for open-burning dumps. In a sanitary landfill, wastes are dumped in a depression or trench after compaction, and covered with dirt every day. A solution to all this can only be in human beings becoming more sensitive to these environment issues.

All waste that we generate can be categorized into three types –

- (a) bio-degradable,
- (b) recyclable and
- (c) the non-biodegradable.

Hospitals generate hazardous wastes that contain disinfectants and other harmful chemicals, and also pathogenic micro-organisms. Such wastes also require careful treatment and disposal. The use of incinerators is crucial to disposal of hospital waste.

Irreparable computers and other electronic goods are known as electronic wastes (e-wastes). E-wastes are buried in landfills or incinerated.

Over half of the e-wastes generated in the developed world are exported to developing countries, mainly to China, India and Pakistan, where metals like copper, iron, silicon, nickel and gold are recovered during recycling process.

## 2.17

**Sewage Treatment Plant**

A major component of this waste water is human excreta. This municipal waste-water is also called sewage. It contains large amounts of organic matter and microbes. Many of which are pathogenic. Before disposal, hence, sewage is treated in sewage treatment plants (STPs) to make it less polluting. Treatment of waste water is done by the heterotrophic microbes naturally present in the sewage. This treatment is carried out in two stages.

**Methods: —**

**Primary treatment**—these treatment steps basically involve physical removal of particles large and small from the sewage through filtration and sedimentation. Initially, floating debris is removed by sequential filtration. Then the grit (soil and small pebbles) are removed by sedimentation. All solids that settle form the primary sludge, and the supernatant forms the effluent.



**Secondary treatment or Biological treatment**—The primary effluent is passed into large aeration tanks where it is constantly agitated mechanically and air is pumped into it. This allows vigorous growth of useful aerobic microbes into flocs (masses of bacteria associated with fungal filaments to form mesh like structures). While growing, these microbes consume the major part of the organic matter in the effluent. This significantly reduces the BOD (biochemical oxygen demand) of the effluent. BOD refers to the amount of the oxygen that would be consumed if all the organic matter in one liter of water were oxidized by bacteria. The sewage water is treated till the BOD is reduced.

The greater the BOD of waste water more is its polluting potential. Once the BOD of sewage or waste water is reduced significantly, the effluent is then passed into a settling tank where the bacterial 'flocs' are allowed to sediment. This sediment is called activated sludge. A small part of the activated sludge is pumped back into the aeration tank to serve as the inoculum.

The remaining major part of the sludge is pumped into large tanks called anaerobic sludge digesters. Here, other kinds of bacteria, which grow anaerobically, digest the bacteria and the fungi in the sludge. The effluent from the secondary treatment plant is generally released into natural water bodies like rivers and streams.

## 2.18

## OCCUPATIONAL ILLNESSES

Occupational illnesses are the serious problem for the working person due to workplace specific hazards. It is arising out of in the course of employment or work environment. It occurs as a result of exposure to physical, chemical, biological and physiological factors in the workplace.

Generally harmful chemical are present in the workplace area and cause the adverse health conditions and damage the people. Example- Lead, Arsenic, Pesticides, mercury, silica.

## 2.19

## Sources of Occupational illness

- ❖ Pesticides industries
- ❖ Coal industries.
- ❖ Paint industries.
- ❖ Cement industries.
- ❖ Pharmaceutical industries.
- ❖ Radioactive manufacturing industries.
- ❖ Mineral extraction—heavy metal extraction.

## 2.20

## Occupational disease

- ❖ **Skin disorders:** — Allergic reactions, dermatitis, skin rashes, itching, skin cancer.
- ❖ **Respiratory disorders:** — Shortness of breath, Chest pain, Chest tightness, Abnormal breathing pattern, asthma etc
- ❖ **Neurological disorders:** — headache, memory disturbance, and peripheral neuropathy, multiple sclerosis, Alzheimer's disease, Parkinson's disease, epilepsy, and stroke.
- ❖ **Hematological disorders:** — Leukemia, blood disorders etc.
- ❖ **Musculoskeletal disorders:** — Muscular spasm, Tendinitis, Carpal tunnel syndrome, Osteoarthritis, Rheumatoid arthritis, Fibromyalgia, Ligament Sprain.
- ❖ **Hepatic disorders:** — Hepatitis A, B, and C, cirrhosis.
- ❖ **Cardiovascular disorders:** — Ischemic heart disease, stroke, chronic obstructive pulmonary disease (COPD, Coronary Artery Disease (CAD), Heart Arrhythmia, Dilated Cardiomyopathy, Pulmonary Stenosis.
- ❖ **Renal and Urinary disorder:** — urinary defects, prostate cancer, kidney failure.
- ❖ **Reproductive and development disorder:** —Reproductive tract infections, congenital abnormalities, cancers of the reproductive system and sexual dysfunction.

**Precaution against Occupational disease**

To prevent occupational disease efficiency, health professionals must know how to anticipate and recognize conditions in those who present with symptoms and those who are pre-symptomatic.

- Regular replacement of the non-hazardous substance for hazardous one.
- Job redesign, work organization, work practices regular necessary condition and alternative.
- Installation of engineering control and devices and provide the educational knowledge and advice.
- For the worker, provide high quality of personal protective equipment.

## 2.21

**Environmental Pollution due to Pharmaceuticals**

- Pharmaceutical companies' release the harmful gaseous like carbon dioxide, nitrous oxide, methane, sulphur compounds etc. which effects the air and cause the air pollution. Due to air we face many problem like—respiratory disease (Emphysema, breathing in comfort, suffocation, etc), ischemic heart disease, stroke, chronic obstructive pulmonary disease (COPD),brain disease. It also a causative agent of green house effects.
- When the pharmaceutical wastes are thrown in the soil then its chemical directly involved in soil and causes the soil pollution and affects the productivity.
- Pharmaceutical drainage directly affects the water and causes the water pollution. Due to pollution many disease borne like diarrhoea, cholera, dysentery, typhoid and poliomyelitisetc.
- In pharmaceutical companies, machinery work performs which produced loud noise and cause the noise pollution.
- Many radioactive materials are released by the pharmaceutical company like X-Ray, Gamma-Ray, heavy metal ions etc. which directly affects the health and causes the chronic disorders.