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ENVIRONMENTAL HAZARD AND ITS IMPACT ON HUMAN HEALTH - AN OVERVIEW

Dr.NIRUPAMA.M
Assistant Professor, Dept of Zoology
Sri Adihunchanagiri First Grade College, Channarayapatna, Hassan (D)

Abstract

An environmental hazard is a substance, a state or an event which has the potential to threaten the surrounding natural environment / or adversely affect people's health, including pollution and natural disasters such as storms and earthquakes. Any single or combination of toxic chemical, biological, or physical agents in the environment, resulting from human activities or natural processes, that may impact the health of exposed subjects, including pollutants such as heavy metals, pesticides, biological contaminants, toxic waste, industrial and home chemicals.

Keywords: *Toxic chemical or physical agents in the environment, metals, pesticides, biological contaminants, toxic waste, industrial and home chemicals.*

Introduction

An environmental hazard is a substance, state or event which has the potential to threaten the surrounding natural environment and/or adversely affect human's health. This term incorporates topics like pollution, natural disasters and human made hazards. Health studies investigate the human health effects of exposure to environmental hazards ranging from chemical pollutants to natural, technologic or terrorist disasters. The environment in which we live can be considered as having three fundamental sets of components, physical, chemical, biological. Associations between an exposure and an adverse health effect do not, on their own, prove that the former is the cause of the latter. Many other non-causal associations could explain the findings.

Physical hazards involve environmental hazards that can cause harm with or without contact. Examples are earthquakes, electromagnetic fields, floods, light pollution, noise pollution, vibration, x-rays etc. Radioactivity is associated with an exposure dependent risk of some cancers notably leukemia. The scientific evidence of adverse health effects from general environmental exposure to these fields is "not proven". If there are adverse effects yet to be proven, the risk is probably likely to be small. Chemical substances causing significant damage to the environment. Tobacco smoke is the single biggest known airborne chemical risk to health, whether measured in terms of death rates or ill-health. To a much lesser degree of risk, these adverse effects apply to non-smokers exposed passively to side stream tobacco smoke.

Health effects of concern are asthma, bronchitis, lung cancer and similar lung diseases, and there is good evidence relating an increased risk of symptoms of these diseases with increasing concentration of Sulphur dioxide, ozone and other pollutants. Biohazards generally fall into two broad categories: those which produce adverse health effects through infection (microorganisms, viruses or toxins) and those which produce adverse effects in non-infective (allergic) ways.

Environmental Hazard

An environmental hazard is a substance, a state or an event which has the potential to threaten the surrounding natural environment / or adversely affect people's health, including pollution and natural disasters such as storms and earthquakes.

Any single or combination of toxic chemical, biological, or physical agents in the environment, resulting from human activities or natural processes, that may impact the health of exposed subjects, including pollutants such as heavy metals, pesticides, biological contaminants, toxic waste, industrial and home chemicals.

Human-made hazards while not immediately health-threatening may turn out detrimental to man's well-being eventually, because deterioration in the environment can produce secondary, unwanted negative effects on the human ecosphere. The effects of water pollution may not be immediately visible because of a sewage system that helps drain off toxic substances. If those substances turn out to be persistent (e.g. persistent organic pollutant), however, they will literally be fed back to their producers via the food chain: plankton -> edible fish -> humans. In that respect, a considerable number of environmental hazards listed below are man-made (anthropogenic) hazards.

Hazards can be categorized in four types:

I. Chemical
II. Physical (mechanical, etc.)
III. Biological
IV. Psychosocial

(i). Chemical

Chemical hazards are defined in the Globally Harmonized System and in the European Union chemical regulations. They are caused by chemical substances causing significant damage to the environment. The label is particularly applicable towards substances with aquatic toxicity. An example is zinc oxide, a common paint pigment, which is extremely toxic to aquatic life.

Toxicity or other hazards do not imply an environmental hazard, because elimination by sunlight (photolysis), water (hydrolysis) or organisms (biological elimination) neutralizes many reactive or poisonous substances. Persistence towards these elimination mechanisms combined with toxicity gives the substance the ability to do damage in the long term. Also, the lack of immediate human toxicity does not mean the substance is environmentally nonhazardous. For example, tanker truck-sized spills of substances such as milk can cause a lot of damage in the local aquatic ecosystems: the added biological oxygen demand causes rapid eutrophication, leading to anoxic conditions in the water body.

All hazards in this category are mainly anthropogenic although there exist a number of natural carcinogens and chemical elements like radon and lead may turn up in health-critical concentrations in the natural environment:

- Anthrax
- Antibiotic agents in animals destined for human consumption
- Arsenic - a contaminant of fresh water sources (water wells)
- Asbestos - carcinogenic
- DDT
- Carcinogens
- dioxins
- Endocrine disruptors

(ii). Physical

A physical hazard is a type of occupational hazard that involves environmental hazards that can cause harm with or without contact. There are many types of physical hazards. Some of them are as follows:-

- Cosmic rays
- Drought
- Earthquake
- Electromagnetic fields
- E-waste
- Floods
- Fog
- Light pollution

(iii). **Biological**

Biological hazards, also known as biohazards, refer to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include medical waste or samples of a microorganism, virus or toxin (from a biological source) that can affect human health.

- Allergies
- Arbovirus
- Avian influenza
- Bovine spongiform encephalopathy (BSE)
- Cholera

(iv). Psychosocial Hazards

Psychosocial hazards include but aren't limited to stress, violence, and other workplace stressors. Work is generally beneficial to mental health and personal wellbeing. It provides people with structure and purpose and a sense of identity.

Prevention of Environmental Hazard Risks

Environmental hazard risks in the disposal sites are mainly from the threat due to the following:

a. Fire
b. Rain/storm
c. Air emissions
d. Ground and surface water contamination
e. Soil contamination
f. Explosion and earthquakes

a. Fire

Fire in the landfill may arise to due to disposal non compatible wastes together or wastes having high ignitability calorific value and reactivity with water, air, acids, and bases. High caloric value (say beyond 2500 cal/kg) wastes may accelerate the process and sustain the fire. Every care has to be taken while deciding the pathway of the disposal as landfill. Fire due to other operations is very remote.

b. Rain/Storm

Heavy rains or storms are not desirable due to the potential of generation of high amounts of leachate. Depending on the rainfall patterns of the area, landfills have to be completely closed or proper temporary cover arrangements have to be made. The storm water drains have to be constructed and maintained to see that they are operational. It is to discourage logging of water in areas where groundwater levels are high.

c. Air Emissions

Dust is the main problem from the point of air emissions. The other emissions due to volatile organics and unpleasant/obnoxious odors may be very well controlled if the organic content in the wastes is restricted. Proper compaction and daily cover combat the entire problem of dust, odors, and volatile gases effectively. The esthetic appeal of the landfill also improves. Spraying of leachate back to landfill in the summer season not only helps in evaporation of leachate but also suppresses the dust.

d. Ground, Surface Waste, and Soil Contamination

The worst scenario is due to failure of a landfill liner system and seepage of leachate into the ground, which ultimately spoils the groundwater. To avoid this problem, experience in design, construction, and operation of landfills is desirable. No activity has to be initiated/executed in the landfill or nearby areas that may cause or is likely to cause damage to the liners. Any spillages on the roads have to immediately be collected and disposed into the landfill time to time. All the storage areas and the operations at stabilization have to be properly monitored for effective functioning in mitigating the contact of waste to the soil and generation of leachate.

e. Explosion and Earthquakes

The possibility of explosion and earthquakes are the ultimate failure cases of the landfills. However, both these possibilities are almost remote. The explosive wastes can be well restricted if proper control on the initial characterization of the wastes and subsequent reactivity tests are conducted for every truck load at the TSD facility. With regard to the earthquakes, the seismologic studies have to be conducted at the stage of site selection itself and landfills have to be developed in non-seismic zones.

Environmental Hazards and How We Can Protect our Health

As we pursue a path of conscious living, we must extend our awareness to the environment, which ultimately is a part of us and will affect us physically and spiritually. With awareness we can contribute to the healing of the Earth, decrease the impact of our own ecological footprint, and share our knowledge with others. Our health and the health of many other species is negatively affected by five broad environmental hazards (the environmental equivalents of lust, anger, greed, pride,

and attachment): electromagnetic fields, radiation, toxic chemicals, toxic metals, and soil mineral depletion.

a. Electromagnetic Fields

Electric and magnetic fields are produced by power lines, electrical wiring, appliances, cell phones, computers, and televisions. Electromagnetic fields, or EMF's, are invisible lines of force that surround any electrical device. Many studies have shown an association between EMF exposure from power lines, and leukemia and brain cancer—although there is ongoing debate about this link. One study showed that when children lived within 50 meters (164 feet) of a transmission line or when the average EMF strength in the home measured greater than 3 mG (milliGausse), the leukemia incidence was higher.

Some 40 studies show that electrical workers have increases in deaths from both leukemia and brain tumors. Laboratory studies demonstrate that EMF exposure causes cancer cells to grow faster than do non-exposed cells, and they become more resistant to destruction by the immune system. EMF exposure is linked to a higher incidence of breast cancer. Extra-low-frequency EMF's disturb the normal growth pattern of cells by interfering with their hormonal, enzymatic, and chemical signals, causing DNA damage. Proximity to EMF's may also cause a drop in melatonin levels, which increases breast cancer risk and lowers immunity.

To protect ourselves from EMF exposure:

- Use a Gauss meter to measure fields in our homes and workplaces and avoid the places where levels are high
- Reduce our reliance on electrical gadgets and appliances (possibly get rid of the microwave)
- Stay three feet away from electrical appliances, where the field strength drops off
- Practice a meditation before bed to attempt to increase nightly melatonin levels
- Become familiar with yoga exercises to balance the body's electromagnetic field and practice them regularly

b. Radiation

Since the 1940's, all life on this delicate planet has been altered by increased radiation exposure. The effects of radiation are cumulative. Younger people are more sensitive to radiation and are more likely to die of cancer because of it. Possible sources of radiation include nuclear fallout from weapons testing, fission materials from nuclear power plants, leaking radioactive disposal sites, flying at high altitudes, and mammograms and x-rays.

A jet flight of six hours exposes us to 5 millirad of radiation (flight attendants have an increased incidence of breast cancer); a chest x-ray exposes us to 16 millirad; and the smallest dose of radiation from a single screening mammogram is 340 millirad. It can take up to 40 or more years for a cancer to appear after radiation exposure. Many of the breast cancer patients I see now were exposed to high levels of radiation as children. Breast tissue is particularly sensitive to radiation. Radiation exerts a greater effect when absorbed into the developing breasts of young women 8-20 years old. When a woman receives significant radiation before the age of 20, she is more likely to develop breast cancer before the age of 35.

To protect ourselves from radiation:

- To limit the effects of radiation from flying, try to travel at night to decrease exposure and take 3 mg of melatonin before and after the flight to protect your cells from damage
- Consume at least two tablespoons of seaweed daily, such as dulse, kelp, or nori, and learn to cook with it. Sea vegetables contain sodium alginate, which is able to bind to radioactive substances so they can be excreted.
- A diet rich in antioxidants or supplements containing vitamins E and C, beta-carotene, grape seed, coenzyme Q10, and the minerals zinc and selenium, is also protective. Pumpkin seeds and Brazil nuts provide us with food sources of zinc and selenium.
- Investigate the possibility of using solar or wind power, design your home to be more energy efficient
- Use fewer electrical devices in order to decrease reliance on nuclear power.
- If you can, choose to live more than 100 miles from a nuclear power plant.

c. Breast Cancer Prevention

Breast cancer prevention begins before conception. Whether you are a man or a woman, if you plan to have children one day, do an intense sauna detoxification at least 6 months before conceiving. Breast milk, nature's "perfect food," contains at least 17 pesticides, 13 furans, 65 PCBs, 10 dioxins, and 30 other organ chlorines. In only six months of breast-feeding, an infant in Canada, the United States, or Europe receives the maximum recommended lifetime dose of dioxin and five times the allowable limit of PCBs set by international standards for a 150-pound adult. A woman passes half of her lifetime accumulation of dioxins and PCBs on to her child when she nurses for just six months.

These contaminants in breast milk affect the neurological, glandular, and immune health of our children for life. PCBs alone are linked to immune deficiency, chronic ear infections, learning disabilities, thyroid abnormalities, and attention deficit disorders in children. If we do the sauna detox before conception, we will not pass this body burden on to our children and subsequent generations. Get together in your community and build a sauna. The infrared saunas are the most efficient at eliminating chemical toxins. If you have children, take them into the sauna with you at least once weekly.

d. Toxic Metals

Over the last two years, I had the mercury fillings in my mouth replaced with ceramic fillings. Although these do contain aluminum, which I was told was inert, I wanted to avoid the estrogenic effect of the plastic fillings. Last month, my husband and I did a 24-hour urine collection from Doctor's Data Lab in the U.S. to test for residues of toxic metals. The toxic metals include aluminum, antimony, arsenic, mercury, nickel, copper, cadmium, and several others. These metals can interfere with glandular function and cause neurological and immune problems, and they are toxic to the kidneys and liver. Several are carcinogens.

Lead, cadmium, and mercury are hormone disruptors. Most people have elevations of at least one of these metals, which may be at the root of a health problem.

As a health precaution, it is useful to do this test once a year. In general, a minimum dose of 2,000 mg of vitamin C daily, 400 IU of vitamin E, 200 mcg of selenium, 50 mg of zinc, and 1,000 mg of N-acetylcysteine or reduced glutathione

offers protection against the accumulation of toxic metals. Coriander helps to remove mercury, and silica helps to remove aluminum. The sauna will also ship these metals out of the body through the skin.

Avoid the use of aluminum foil and aluminum pressure cookers or pots. Do not use and avoid contact with pressure-treated wood, which contains arsenic. Check the web sites listed above to find out which metals may be in your air or water from local industries.

e. Soil Mineral Depletion

Just as the sperm count in men has dropped 50% in the last 40 years, so too has the mineral content of the soil and the food we eat dropped substantially. There is a connection. Analysis has found that in the last 50 years the average potato has lost 100% of its vitamin A, 57% of its vitamin C and iron, 50% of its riboflavin, 28% of its calcium, and 18% of its thiamine. Broccoli has lost over 50% of its calcium and vitamin A and over 30% of its iron, thiamine, and riboflavin. That's a heavy loss.

In general, farmers are not replenishing the soil with compost, seaweed, or bone meal to keep the mineral content high. Industrial farming relies on fertilizers and pesticides to make the food look good rather than to boost nutritional value. Consequently the "soil" in our bodies will be mineral and nutrient deficient unless we know how to nourish it in today's environment.

The foods with the highest mineral content are the seaweeds and seeds.

- Use 2 tablespoons of sea vegetables daily, or take a kelp supplement.
- Replace regular salt with sea salt. Consume a total of 2-4 tablespoons of sunflower, pumpkin, flax, and sesame seeds daily.
- For your vitamin fix, be sure to eat six to nine servings of fruits and vegetables daily, and take a powdered green supplement at least once daily.
- Use a good-quality multivitamin and mineral supplement as well.

e. Making Conscious Choices

It is difficult to comprehend the magnitude of the environmental devastation we participate in with our daily use of chemical toxins. I feel overwhelming grief when I reflect upon and absorb this information. Kundalini Yoga gives me the capacity to live with this knowledge and act on it to create positive change to protect the Earth. I do what I can in my local sphere, and I ask you to join me to create a global shift. We can become the white blood cells of the Earth to create a healthier future for all by changing our own environment and educating others.

We can make conscious choices to protect ourselves and future generations from the cumulative effects of hormone-disrupting chemicals:

- Eat lower on the food chain, consume a primarily vegetarian diet, and minimize meat, fish, and dairy products.
- Choose to exercise your power as a consumer and stop buying plastic, particularly PVC plastic and food stored in plastic.
- Grow or buy organic food and ask supermarkets to stock it.
- Educate neighbors who spray their lawns about the effects of pesticides on health and find alternatives to chemical sprays.
- Support the World Wildlife Fund, the Sierra Club, Greenpeace, or other organizations that are trying to make a difference—or create your own group.

- We can sweat out most of these chemicals through regular sauna use. (Adhere to standard medical cautions when using a sauna.) Set a goal of 150 hours of sauna time and determine the shortest time possible for you to achieve this goal. Details on sauna detoxification are found in my book, The Complete Natural Medicine Guide to Women's Health.

Describing environmental exposure to hazards

To reduce the adverse impacts of environmental hazards on human health you need to understand where the hazard comes from, identify it and the pathway it can take to affect people.

The *source of the hazard* is the place of origin from proposed and existing activities. Patients and carriers discharge infectious agents (biological hazards) that could infect healthy people. Industrial processes in a factory release chemical hazards that may be found in sewage; the sewage could reach drinking water, thereby creating the possibility of ingesting these chemicals. Household activities could also be sources of hazards, for example, cooking with fuels such as animal dung and charcoal produces toxic smoke that can cause lung diseases.

The *type* of hazard is the particular chemical, infectious agent or other agent involved. The *pathway* is the route by which the hazard gets from the source to the person.

The *response* or the effect is the health outcome (changes in body function or health) after the hazard has affected the person. The amount and type of change (or response) depends on the type of hazard and the effect it can have on different people. This would depend on the person's individual health and factors such as their age; for example, young children or people who are already sick are often more harmed by diseases such as diarrhoea than healthy adults.

If you want to prevent a hazard, you need to understand the source of the hazard (where it comes from), the type of hazard (for example the type and concentration of a chemical), the pathway (the affected environment and how the exposure could take place), and the response (the effect the hazard could have on people).

We will demonstrate this with an example. Sewage containing cadmium (a toxic chemical) is produced by a hide-processing factory and flows into a river. People downstream of the point of discharge drink the contaminated water and become sick. The hazard exposure is described as follows:

- The source is sewage from a factory.
- The type of hazard is chemical, in this case cadmium.
- The pathway or affected environment is the river that is used by the public as a source of drinking water and the exposure took place by swallowing/ ingesting the chemical with drinking water. In addition, any fish contaminated with cadmium may have been eaten.
- The response is that people who consumed the contaminated water and fish had symptoms of cadmium poisoning (i.e. joint and spinal pains, pains in the abdomen) and they complained to a health centre.

Environmental pollution

Pollution is the introduction of contaminants into an environment causing harm, instability or disorder to the ecosystem. (An **ecosystem** includes all the living organisms (plants, animals, microorganisms) and their physical environment and

the interactions between them.) Pollution can be also defined as the presence of a substance in a medium or environment that results in a change to its 'natural' state, potentially causing an adverse effect. Pollution, however, is not simply the introduction of contaminants. There is always a response in the form of modification or change in the environment. From this standpoint, pollution is the harm that results because substances are present where they would not normally be found, or because they are present in larger than normal quantities.

Contaminants are not necessarily pollutants. A **contaminant** is a minor substance, material or agent that is unwanted in the environment and may or may not be harmful. A **pollutant** is a contaminant which, due to its properties or amount or concentration, causes harm. Gases (carbon monoxide, ozone, nitrogen dioxides), chemical vapours, dust particles, fumes and liquid chemicals (pesticides, solvents, drugs, acids, etc.) are examples of potential pollutants of air and water ecosystems.

a. Air pollution

This occurs with the release of chemicals in gaseous or dust form into the atmosphere. Household cooking, industries, vehicles and incinerators are common sources of air pollution.

b. Water pollution

Water can be polluted by the release of liquid waste (human, animal or industrial) into rivers, streams and lakes. A common type of water pollution is organic material such as human and animal wastes and in waste water from food processing. These wastes can be removed from rivers and lakes by the self-cleaning processes described above but, if present in large quantities, the biodegradation process can reduce the level of dissolved oxygen in the water so much that fish and other aquatic life cannot survive. As well as these environmental impacts, water contaminated with human waste is a significant cause of many diseases that will be described in more detail elsewhere in this Module. Some pollutants can be extremely harmful even if they are taken in small quantities and may cause cancer, reproductive health effects (abortion, embryo malformation, birth defects) or nerve damage when the contaminated water is consumed.

c. Land/soil pollution

This occurs when land is used as a site for accumulating wastes that are generated from various sources (industry, agriculture, health facilities, villages, private and public organisations). These wastes may be biologically, chemically or physically hazardous to plants and animals. The pollution by chemicals such as pesticides may have long-term consequences, such as groundwater pollution.

Principles of hazard management

You may be asked to plan how to manage environmental hazards, say in a Health Post or mill house that exists in your locality. Involvement in hazard management requires you to follow certain steps, which are outlined below.

(i). Establish the context and identify the hazard: These are the first steps. You have learned that a hazard is something that is harmful to our health. You should identify the type of the hazard in as much detail as you can. You should also describe the exposure conditions and try to answer the following questions: What is the source of the hazard? Who is exposed? What are the pathways or activities

that expose a person? What part of the environment is involved in the transfer of the hazard to humans?

(ii). Hazard/risk analysis and evaluation: Here you would analyse the risk and evaluate the potential of the hazard to cause damage to health. This step needs a deeper appraisal in collaboration with the *woreda* environmental health worker. The evaluation may require appropriate design, sampling and laboratory investigation.

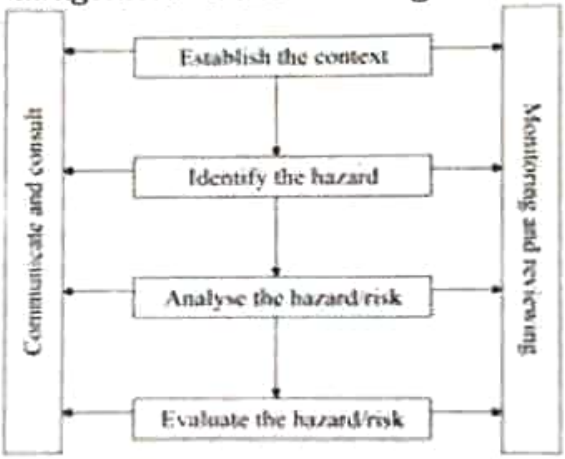
(iii). Communicate and consult: When the hazards and risks have been determined, advice can be communicated on the interventions or control measures that are needed to control the hazard. There can also be consultations with relevant people and organisations.

(iv). Treat the hazard/risk: The interventions or control measures are carried out by the person or people responsible for the hazard or risk.

(v). Monitoring and reviewing: The implementation of interventions or control measures for the hazard must be followed up in order to determine whether they are successful. Correction measures can be applied if there is any failure. Identifying appropriate indicators for monitoring is critical and must be done formally.

(vi). Record keeping: Keeping records and reports on hazard management is always important. These records must contain the type of hazard, exposures and what control measures were taken.

The process of hazard management is shown in Figure 2.4.



Conclusion

The environment in which we live can be considered as having three fundamental sets of components, physical, chemical, biological. Associations between an exposure and an adverse health effect do not, on their own, prove that the former is the cause of the latter. Many other non-causal associations could explain the findings.

The environmental hazards posed by cyberspace are by no means obvious. There are some. The wide availability of data on everything from trees to fish means that the location and use of resources is no longer limited to those who can afford to go out and look for them. The barriers to entry into the exploitation of resources market have been significantly reduced, and just as there is an upsurge in the demand for resources, so the cost and ability to look for them comes down.

Cyberspace has contributed to a free-for-all in this respect. The use of rare earths in the manufacture of the equipment used in cyberspace has had an environmental impact. The location of these rare earths may be a source of power for some states, a development opportunity. The disposal of used and out-of-date resources has had an impact. Cyberspace has contributed to the development of urban areas and to the encroachment of previously wild territories for agriculture (it is safer to manage your livestock in a wilderness area with a mobile phone than without one). Geolocation technology has enhanced the search for oil but also found it in environmentally sensitive areas

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