

# Chapter 1

## INTRODUCTION

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### 1.1 ENVIRONMENT

According to Webster dictionary Environment is defined as; “the complex of physical, chemical, and biotic factors (as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival” (Webster dictionary)

The word ‘Environment’ is derived from the French word ‘Environner’ which means to encircle, around or surround. Literary environment means the surrounding external conditions influencing development or growth of people, animal or plants; living or working conditions etc. In this meaning one can seek the answer for what is surrounded, by what is surrounded and where it is surrounded. For example an animal is surrounded by the air, soil, other animals i.e. sum total of condition at that particular period of time and space on the earth.

However, other well-known definitions of others scientist are;

**Boring:** ‘A person’s environment consists of the sum total of the stimulation which he receives from his conception until his death.’ It can be concluded from the above definition that Environment comprises various types of forces such as physical, intellectual, economic, political, cultural, social, moral and emotional. Environment is the sum total of all the external forces, influences and conditions, which affect the life, nature, behaviour and the growth, development and maturation of living organisms.

**Douglas and Holland:** ‘The term environment is used to describe, in the aggregate, all the external forces, influences and conditions, which affect the life, nature, behaviour and the growth, development and maturity of living organisms.’

## **1.2 ENVIRONMENTAL SCIENCES**

The science of Environment studies is a multi-disciplinary science because it comprises various branches of studies like chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc. It is the science of physical phenomena in the environment. It studies of the sources, reactions, transport, effect and fate of physical a biological species in the air, water and soil and the effect from human activity upon these.

According to Wikipedia, Environmental science is an interdisciplinary academic field that integrates physical, biological and information sciences (including ecology, biology, physics, chemistry, zoology, mineralogy, oceanology, limnology, soil science, geology, atmospheric science, and geodesy) to the study of the environment, and the solution of environmental problems.

## **1.3 ROLE OF ENVIRONMENT IN HUMAN LIFE IN TERMS OF QUALITY OF LIFE**

Human life cannot exist independently; it is actually an indispensable part of environment constituting most important factors which decide the quality of human life and existence. Environment plays predominant role in the life of all organisms.

According to the Eurostar online publications, eighth dimension of the '8+1' quality of life indicators framework is natural and living environment. The environment, while usually discussed in the context of sustainability, is equally important for the quality of life of individuals. Environmental conditions not only affect human health and well-being directly, but also indirectly, through adverse effects on ecosystems and biodiversity or even more drastically by causing natural disasters or industrial accidents. This indirectly can affect the gross domestic Product (GDP) too (<http://ec.europa.eu>).

## **1.4 DEFINITION OF HEALTH**

Health in simple terminologies is the absence of disease. Nevertheless, the classic definition which is given by World health Organization (WHO) is widely

used and is as follows “health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”(WHO’ formulated in 1948)

However, this definition is challenged by many of the new age scientist owing to the increase in the number of chronic diseases. And they propose to define health as the ability to adapt and to self-manage (WHO).

Environment is one among the many determinants of the human health. The key to man’s health lies largely in his environment and the study of the disease is really the study of man and his environment. Hippocrates was the first person who related environment and the disease. Later the concept of disease and environment association was revived by Pettenkofer (Park, 2007).

The macro or the external environment is all that which is external to the individual human host. And the modern concept of the environment is not limited to water, air and soil (physical environment), but also the social and economic condition to which the host is exposed (Park, 2007).

## **1.5 DEFINITION OF ENVIRONMENTAL HEALTH**

Environmental health has been defined in a 1999 document by the World Health Organization (WHO) as:

Those aspects of the human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially and affect health.

Environmental health as used by the WHO Regional Office for Europe, includes both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often indirect) on health and well-being of the broad physical, psychological, social and cultural environment, which includes housing, urban development, land use and transport (Novice and Robert, 1999).

As of 2016 the WHO website on environmental health states "Environmental health addresses all the physical, chemical, and biological factors

external to a person, and all the related factors impacting behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments. This definition excludes behaviour not related to environment, as well as behaviour related to the social and cultural environment, as well as genetics (WHO).

## **1.6 OCCUPATIONAL ENVIRONMENT**

‘Occupational Environment’ means the sum of external conditions and influences which prevail at the place of work and which have a bearing on the health of working population.<sup>7</sup>The interaction of the individual with the physical, chemical and biological agents of the work place as great bearing on his physical and the psychological health.

Every work place is really a ‘work environment’ where there are interactions between people and the chemical and physical demands involved with performing job. That is the health of workers in a large measure will be influenced by conditions prevailing in their work place (WHO).

## **1.7 OCCUPATIONAL HEALTH**

As defined by the World Health Organization (WHO) "occupational health deals with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards". Occupational health is a multidisciplinary field of healthcare concerned with enabling an individual to undertake their occupation, in the way that causes least harm to their health. Again this definition was refined and a definition which was shared by both World health Organization and the International Labour Organization was proposed for the Occupational Health and is as follows;

"The main focus in occupational health is on three different objectives: (i) the maintenance and promotion of workers’ health and working capacity; (ii) the improvement of working environment and work to become conducive to safety and health and (iii) development of work organizations and working cultures in a

direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings. The concept of working culture is intended in this context to mean a reflection of the essential value systems adopted by the undertaking concerned. Such a culture is reflected in practice in the managerial systems, personnel policy, principles for participation, training policies and quality management of the undertaking."- Joint ILO/WHO Committee on Occupational Health (1995).

## **1.8 MINING AS AN OCCUPATION**

Mining is an ancient occupation, long recognized as being arduous and liable to injury and disease (Occupational Health Services and Practice, 2013). The lifecycle of mining consists of exploration, mine development, mine operation, decommissioning and land rehabilitation. Mining is a multi-disciplinary industry, drawing on several professions and trades. To ensure precision in clinical and epidemiological work, it is important to enquire about the details of tasks, as the term ‘miner’ is relatively non-specific. Mining is traditionally classified as metalliferous or coal, and as surface or underground. Metalliferous mining can also be classified according to the commodity being mined. Some degree of minerals processing is usually undertaken at mine sites. For metalliferous mining, many of the occupational health hazards relate to these metallurgical processes. (Occupational Health Services and Practice, 2013).

Mining has always been among the most hazardous of occupations known to human beings, but still the rapidly increase in demand of the metals and minerals of all kind as greatly increased the demand of mining (Donoghue, 2004).

## **1.9 EFFECT OF MINING ON GENERAL HEALTH**

The effects of mining can be of many categories, which include Physical Hazards like the damage caused due to the heat, humidity, noise, vibration etc, chemical hazards, biological hazards, psychosocial Hazards and the ergonomic Hazards (Occupational Health Services and Practice, 2013).

The accident records of the industrialized countries during the Second World War clearly reveal that the number of casualties resulting from industrial accidents was almost as high as that of war casualties. The situation is worse in developing countries with their low capital, less advanced technology, and undertrained workers.

The mining industry has frequently appeared in the list of the most dangerous trades in many countries. This is not surprising, because miners are constantly facing new adverse conditions underground and their working environments are maintained solely on an artificial basis. Underground mines are more dangerous than open cast mines. The following table summarizes the effect of mining attributed to the different categories quoted above (Occupational Health Services and Practice, 2013);

**The major health hazards in mines (Occupational Health Services and Practice, 2013)**

<b>Agents</b>	<b>Hazards</b>	<b>Conditions</b>
<b>Physical</b>		
High temperature and humidity	Heatstroke; heat cramp; heat exhaustion; lassitude; irritability; collapse; anxiety; lowered morale	Deep underground work
Cold	Frostbite; trench foot; aggravated Raynaud's disease	Ground work in winter; high-altitude mines
Sudden variation in temperature	Respiratory diseases; aggravated rheumatism	Moving from hot working areas to cold surface conditions
Change of atmospheric pressure	Bends (joint pain); chokes (chest pain); air embolism; neuralgia toothache; paranasal sinusitis	Work in deep underground or high altitude mines

<b>Agents</b>	<b>Hazards</b>	<b>Conditions</b>
Poor lighting	Nystagmus (now rare); loss of visual acuity; giddiness	Face work
Noise	Occupational deafness	Rock drilling; blasting
Vibration	Raynaud's syndrome	Rock drilling
Ionizing radiation	Radiation hazards	Working with radioactive ore
Limited working space	Beat disease (cellulitis and bursitis of joints); displacement and dislocation of joints	Work in narrow seams and in contorted positions
Accident	Various	Dangerous work both in and out of the pit
<b>Chemical</b>		
Dusts	Pneumoconiosis (silicosis, coal miner's lung, siderosis); induced and aggravated respiratory disease; poisoning by lead, arsenic, mercury, manganese, etc	Working with mineral dust both in and out of the pit
Poisonous gases; oxygen deficiency	Gas poisoning (CO, CO <sub>2</sub> , NO <sub>x</sub> , SO <sub>2</sub> , methane); anoxia (dyspnoea, dizziness)	Blasting; inadequate ventilation
Mine water	Occupational dermatoses	Underwater work in the pit
<b>Biological</b>		
Parasitic and fungal infections	Ankylostomiasis; sporotrichosis; tinea pedis and/or capitis; leptospirosis (Weil's disease)	Pit work where parasites and fungi grow easily owing to high humidity and poor sanitation

## **1.10 EFFECT OF MINING ON ORAL HEALTH**

According to the World Health Organization Oral health is a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the oral cavity (Cho and Lee, 1978).

The compartmentalization involved in viewing the mouth separately from the rest of the body must cease because oral health affects general health by causing considerable pain and suffering and by changing what people eat, their speech and their quality of life and wellbeing. Oral health also has an effect on other chronic diseases (WHO; oral health topics). Because of the failure to tackle social and material determinants and incorporate oral health into general health promotion, millions suffer intractable toothache and poor quality of life and end up with few teeth.

Health policies should be reoriented to incorporate oral health using sociodental approaches to assessing needs and the common risk factor approach for health promotion (WHO; oral health topics; Petersen, 2003). Oral diseases are the most common of the chronic diseases and are important public health problems because of their prevalence, their impact on individuals and society, and the expense of their treatment.

A thorough oral examination can detect signs of nutritional deficiencies as well as a number of systemic diseases, including microbial infections, immune disorders, injuries, and some cancers. Indeed, the phrase the mouth is a mirror has been used to illustrate the wealth of information that can be derived from examining oral tissues.

Recently, it has been recognized that oral infection, especially periodontitis, may affect the course and pathogenesis of a number of systemic diseases, such as cardiovascular disease, bacterial pneumonia, diabetes mellitus, and low birth weight (Sheiham and Watt, 2000; Scannapieco, 1994; Xiaojing *et*

*al.*, 2000; Scannapieco, 1990). Three mechanisms or pathways linking oral infections to secondary systemic effects have been proposed: (i) metastatic spread of infection from the oral cavity as a result of transient bacteremia, (ii) metastatic injury from the effects of circulating oral microbial toxins, and (iii) metastatic inflammation caused by immunological injury induced by oral microorganisms. Periodontitis as a major oral infection may affect the host's susceptibility to systemic disease in three ways: by shared risk factors; subgingival biofilms acting as reservoirs of gram-negative bacteria; and the periodontium acting as a reservoir of inflammatory mediators (Sheiham and Watt, 2000). The ignored signs and symptoms of oral disease and dysfunction are detrimental (Xiaojing *et al.*, 2000). Consequently, oral health is integral to general health. You cannot be healthy without oral health. Oral health and general health should not be interpreted as separate entities. Oral health is a critical component of health and must be included in the provision of health care and the design of community programs.

### **1.11 OCCUPATIONAL ORAL HEALTH HAZARDS**

Oral health, as already mentioned is an integral part of general health and plays an important role in improving the quality of life. The oral cavity is vulnerable to external agents, and some occupational exposures are associated with oral changes in both hard and soft tissues (Oshikohji *et al.*, 2011). Environmental hazards contribute to poor oral health in many occupations, as oral cavity is a port of entry for many diseases and present several unique features, which makes it especially prone to occupational diseases (Tatiana *et al.*, 2008; Schour and Sarnat, 1942). Oral cavity injuries which occur as a direct result of an occupation are rather common. The injurious effect of occupational hazards may manifest themselves in the teeth, jaw bones, periodontal tissues, tongue, lips, and oral mucosa. The effects of the various etiologic agents responsible for oral occupational disease depend on their specific chemical, physical and bacterial nature, their physical state, and their mode of entry (Khurana *et al.*, 2014).

The etiology of oral cavity diseases involves an array of environmental, genetic, immunologic, and sociobehavioral factors including education, oral

hygiene habits, and dental care access. As is mentioned earlier in this section the location and multiple functions of the mouth make it particularly vulnerable to external aggressions (Petersen and Henmar, 1988).

An occupational disease may be defined as a negative change in health condition directly resulting from more or less prolonged exposure to harmful substances or conditions immediately related to the individual's work. It should be differentiated from an occupational accident, which is of sudden occurrence. The injurious effect of occupational hazards may manifest themselves in the teeth, the jaw bones, the periodontal tissues, tongue, lips, and oral mucosa. The effects of the various etiologic agents responsible for oral occupational disease depend on their specified chemical, physical, and bacterial nature, their physical state, and their mode of entry (1), Injuries of the oral cavity which occur as a direct result of the occupation are of rather common occurrence. In recent years industrial health programs have recognized the necessity of maintaining oral health and have emphasized the need for special precautions to prevent oral injuries (Vianna *et al.*, 2005).

The tissues of oral cavity may be affected by toxic agents either by direct action as exposure to sulfuric acid fumes or through systemic exposure as poisoning with heavy metals e.g. lead and mercury. Teeth, periodontal tissue, lips, tongue, mucous membrane, salivary glands and jaw bones may be affected depending on the type of exposure (Petersen, 1989). Sometimes, pathologic changes in oral cavity may be the first sign that indicates absorption or toxicity related to certain toxic agents, e.g. lead and mercury poisoning (Peterson and Gormont, 1991). Due to the substantial increase in the use of chemical substances that have adverse effects on oral health, industrial dentistry has become a subject of major consideration and constituted a new branch in the field of dentistry. Chronic Lead exposure favors the formation of cheilitis, fissures, ulcers and epithelial desquamation of the tongue, palate and other parts of the oral mucous membranes (Said *et al.*, 2008).

## 1.12 MINING AS AN OCCUPATION AND THE ORAL HEALTH

Every work place is really a work environment where there are interaction between the people and the chemical and physical demands involved with performing the job. It is considered that the industrialization is the sign of progress and this can be proved by the fact that all the developed countries in the world are the contributions of the industrialization. It also is the fact that industrial progress and the growth of a nation go hand in hand. Alteration of the natural existing physical environment by such kind of progress has made the man to live in a complicated environment. By each day the complexity is increasing as man is becoming more ingenious. If these trends persist, it is feared that the very “Quality of Life” we cherish may soon be in danger (Park, 2007).

Mining is one of the major industries flourishing throughout the world. A large number of labourers work in the stone crushing and mining industry in India (Semple *et al.*, 2007). In India, Rajasthan is the place where most of the marble, zinc, copper and other mines are found. As part of general health of these workers; their exposure to respirable crystalline silica and a number of other particulate matter exposure metrics in occupational settings. Marble mining is associated with environmental pollution along with this it also is associated with the release of harmful chemicals like asbestos (Jehan and Ahmad, 2007). In the long run all these respirable particulate matters and the consuming of chemically contaminated water and food may affect the physical health as well as dental health. It is worth a goal to explore the effect of the mining on the oral health of the people working in such kind of environment.

Suspended particulate matter (SPM) refers to the mixture of solid and liquid particles in air. In a broader sense the term applies to matter in the atmosphere classed into particles having a lower size limit of the order of 10–3 mm and an upper limit of 100 mm. SPM, a complex mixture of organic and inorganic substances, is a ubiquitous air pollutant, arising from both natural and anthropogenic sources. Ever since the advent of the industrial era, anthropogenic sources of PM have been increasing rapidly (Mohanraj and Azeez, 2004).

The dust swirling around in quarries is mineral powder that causes a number of lung diseases, such as silicosis, tuberculosis (TB), silico-tuberculosis and asthma. Exposure to chemical, physical, and biological agents in the workplace can result in adverse effects on workers ranging from simple discomfort and irritation to debilitating occupational diseases such as lung fibrosis, neuropathy, deafness, organ damage, and cancers of various sites (Verma *et al.*, 2002). For the overall wellbeing of the person, dental health is as essential as total body health. It is essential to know the prevalence and the treatment needs of occupational disease related to oral health among labourers.

Besides strenuous working hours of the mining makes the labourers to force themselves to indulge in bad habits of tobacco smoking, chewing and alcohol drinking which makes them prone to all types of oral ailment, some of which are known to be fatal and life challenging too. Because of their long working hours, Social boycott, lack of any other social activity in the mines and the absences of the family and children makes them more attracted to the drugs which a very quick habit forming and can be the cause of the oral cancers, lung cancers, tuberculosis, black lung and upper respiratory tract infections. These are chronic infections and are expensive to treat without any chances of total cure or the recovery.

Thus, oral health is an integral part of the general health of the person and it cannot and could not be ignored at any cost. As the saying goes that a healthy mind dwells in a healthy body.