Occupational health

Occupational health

Definition by WHO :promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations.

Consequences of occupational diseases:

- Increased cost of diagnosis,treatment, and rehabilitation.
- loss of production
- increases sick absenteeism.
- Lost working days
- Decreased national production and development

Occupational Hazards

1. **Physical**
2. **Chemical**
3. **Biological**
4. **Mechanical**

1- Physical Agents

1- Heat

Heat cramps

Etiology: the body will loss water through evaporation of sweat , loss of fluid and sodium chloride, causing heat cramps

Manifestations:

- Sever intermittent cramps of voluntary muscles
- May be the visceral muscles causing nausea,vomiting and colic

Prevention:

- Ensure physical fitness of workers
- Cooling of work place
- Giving suitable dose of prophylactic sodium chloride tablets

Treatment: Adequate dose of sodium chloride oral

1- Physical Agents

Heat exhaustion:

Etiology: heat loss by sweating and marked peripheral vasodilatation

Manifestations: wet skin due to sweating, collapse and circulatory failure

Heat stroke

Etiology: failure of the body to loss heat in hot humid air

Manifestations: hyperpyrexia 40C or more, very hot dry skin, muscle cramps, irritability.

Prevention: fulfilling requirements of cooling power of air

Management: the case must be immediately removed from adverse environment, and lowering body temperature by all means as ice bath give saline intravenously

1- Physical Agents

Sun stroke: it is a form of heat stroke that result from severe exposure to sun rays

Etiology: action of sun rays, causing meningeal irritation, together with interference with heat loss from the body

2- Cold: workers are exposed to low atmospheric temperature in cold storage rooms

- **Chilling & predisposing to respiratory infection:** if body temperature reaches below 28C confusion and loss of consciousness occur & death occur when body temperature fall to 21C
- **Frost bite:** spasm with agglutination of blood in the vessels due to low temp -5& -10C leading to ischemia, necrosis, gangrene

Prevention: using suitable protective clothing & heating by radiators

1- Physical Agents

3- Heat Pressure

Caisson workers and sea divers are exposed to high pressure while staying deeply under water

If the process of decompression (returning to the surface) is rapid , they show manifestations of caisson disease

Etiology:

- On exposure to high pressure more oxygen and nitrogen gases dissolve in blood
- On rapid decompression there is rapid lowering of pressure causes bubbling of the more dissolved gases
- Oxygen is going to be utilized by the tissues while nitrogen bubbles cause embolic phenomena

1- Physical Agents

Manifestations:

- **Mild:** skin manifestations, pain in the joints and muscles
- **Moderate:** meniere,s syndrome due to emboli labyrinth , manifested by headache, nausea, vomiting, nystagmus, staggering gait, deafness
- **Sever:** emboli in CNS, parenthesis & weakness to total paralysis of the lower extremities, monoplegia. Emboli in the heart & lung haemoptysis

Prevention: decompression of worker must be slow enough

Treatment: recompression where nitrogen bubbles re-dissolve, followed by slow enough decompression in special pressure regulated unit

1- Physical Agents

4- Low Pressure(high altitude sickness hypoxia) (mountain)

Hypoxia: is due to decrease O2 at high altitudes

Mechanical effects:

- Displacement of middle ear
- Abdominal distension by gases
- Dysnea & rupture emphysema
- Tooth ache

Physical effects:

- CNS: nausea, vomiting , mental confusion, disturbed speech
- GIT: nausea, vomiting , loss of appetite , abdominal pain
- CVS: tachycardia, increase in cardiac out put

Respiration: rapid deep respiration & periodic breathing

Chronic Effect: increase pulmonary ventilation, blood pressure, O2 dissociation curve, decrease metabolism

Prophylaxis: pressurized aeroplanes, supply O2 breathing apparatus, special training of pilot, never work above 4000 meter height

1- Physical Agents

5- Noise: it is unpleasant sound or non harmonious harsh sound

Exposure to noise:

Occupational exposure: weaving, hammering

Non –industrial exposure: noisy places as airports, telecommunication halls & traffic personnel

Non occupational: noisy environment in crowded cities & towns

Determining factors of noise induced hazards

Noise properties : Degree of intensity, frequency of vibrations

Exposure factors: duration, pattern

Personal factors: age, individual susceptibility

1- Physical Agents

Hazard of exposure to noise

Non auditory hazards: irritability, fatigue, nervousness

- Lack of communication
- Lack of concentration
- Diminished performance of work & productivity
- Sudden noise induce sense of fear, hypertension

Auditory hazards:

- Tinnitus, and other auditory troubles
- Gradual progressive impaired hearing and hear loss
- Reduce hearing

1- Physical Agents

Prevention:

- Using modem machines and devices
- Segregation of noisy processes in a remote place
- Isolation of the noisy machines & sound-proofing of the place
- Regular monitoring of sound intensity of workplace

Measure for workers:

- Pre-placement medical examination
- Using protective earplugs or muffs
- Periodic measurement of hearing level

Control:

- Periodic health appraisal by medical examination
- Periodic screening of those having individual susceptibility, and early diagnosis of impaired hearing for further management by:
- Protective measures and precautions
- Shift to some other noise exposure free work

7-RADIATION

Types	Sources	Health Effects
Ionizing	X-rays Gamma rays Particles alpha & beta	Cancer, congenital defects, death
Non-ionizing	Ultraviolet	skin redness, premature skin ageing, and skin cancer
	Infrared	corneal and conjunctival burns, retinal injury, cataract
	Visible light	Eye problem

1- Physical Agents

Exposure may be occupational and non occupational

- Mining of radioactive ores and in some industries
- Medical personal of radio diagnosis and radio therapy
- Search for under sea or under ground for petrol layers
- Research in atomic and science institutes

Basic preventive measures:

1- Environmental Measures:

- Substitution of radioactive materials & operation
- Isolation of sources by shielding
- Segregation of suitable distance from man, with barriers
- Monitoring of exposure by period/sitting, total number of exposures

2- Medical Measures:

- Pre-placement medical examination include blood picture
- Periodic medical examination
- Using personal protective devices as leaded aprons

1- Physical Agents

8- Poor lighting

- Coal miners who work under very poor lighting for long time (years) are exposed to miners nystagmus
- Now it is not a problem because electric lamps are used for lighting of mines

1- Physical Agents

9-VIBRATION

- Physical factor which affects man by transmission of mechanical energy from oscillating sources

Types

- Segmental vibration
- Whole body vibration

1- Physical Agents

1-Segmental Vibration:

- **Health Effects:**
- Hand Arm Vibration Syndrome (HAVS)
- tingling, numbness, blanching of fingers
- pain

2-Whole Body Vibration:

- **Health effects:**
  - Fatigue
  - Irritability
  - Headache
  - Disorders of the spine

1- Physical Agents

Prevention & control

Source:

- Automation & remote control of the machine
- Good maintenance of the machine
- Change in the weight of machine and instruments

Workers

- Pre-employment examination
- Periodic examination & investigation
- Radiography to the bone of the hand for segmental vibration
- Personal protective clothes e.g. thick gloves
- Prevent smoking

2- Chemical Agents

1- Dust: is the solid particles suspended in air

- Lung disease caused by inhalation of fine dust in industry is called “pneumoconiosis” dust may be:
  - **Inorganic :**silica & asbestos dust
  - **Organic :** cotton dust , bagasse

Pneumoconiosis

Factors influencing lung reaction to dust

Factors related to the dust:

- Nature and composition or content of the dust
- Size of dust particles: so fine, less than 5 microns in diameter
- Dust concentration

Factors related to exposure:

- Period of exposure/day of work
- Presence of synergistic factors particularly cigarette smoking , and inhalation of radon gases may accelerate onset and increase severity of Pneumoconiosis

2- Chemical Agents

Silicosis: is the most frequent and disabling pneumoconiosis caused by inhalation of silica dust that induces fibro-nodular reaction of the lung

Exposure: workers in the following industries are exposed to silica dust:

- Glass, pottery, ceramic, industries
- Sand blasting and mineral polishing
- Foundry workers

Manifestations:

- The lung shows nodular fibrosis after years of exposure
- The case suffer from progressive dyspnea, cough
- Right heart failure & total incapacity
- Increase the susceptibility to pulmonary tuberculosis

2- Chemical Agents

Asbestosis: is a mixture of fibrous silicates about 20 microns long

- Asbestos is used for manufacture of fireproof, and insulation material

Etiology:

- Inhalation of asbestos fibers causing diffuse fibrous scarring of lung, pleural thickening and emphysema
- Cases of asbestosis are more susceptible to lung cancer

2- Chemical Agents

Byssinosis : due to exposure to cotton dust during two processes:

- Opening cotton bales, and spreading compressed lint
- Ginning of cotton

Etiology: allergen found in cotton dust, producing bronchospasm

Clinical picture:

1- Monday fever:

- It is the initial stage that appears after 10 or more years of exposure
- It is characterized by transient recurrent attacks of irritating cough and respiratory manifestations:
- Appear on returning to work after weekend or other leaves , for some days then disappear

Reappear after the next leave or rest and so on

2- stage of asthma and bronchitis attacks

3- Stage of severe chronic bronchitis-emphysema syndrome, after about 20 years of exposure: stage of complete disability

2- Chemical Agents

Bagassosis

- Bagasse is the cellulose fiber of cane sugar after extraction of sugar
- It is dried to be used for manufacture of hardboard and insulating material
- Crushing bagasse in manufacture gives dust
- Inhalation of that dust causes bagassosis with acute respiratory manifestations , after weeks of exposure

2- Chemical Agents

Farmers' Lung: is a disease condition caused by inhalation of spore bearing dust , on handling mouldy hay and straw

- Shortly after exposure, the farmer shows general and respiratory manifestations (cough, dyspnea) , which are mild , temporary and self limited
- Manifestations disappear on stopping exposure to reappear on re-exposure and so on

2- Chemical Agents

Benign pneumoconiosis

- Dust of iron, calcium, tin,barium,and coal is inert "Benign pneumoconiosis"
- Anthracosis : coal miner's pneumoconiosis , coal dust disease: is caused by long exposure to high concentrations of coal dust, in coal mining .
- Though the lungs may appear heavily black on prolonged inhalation of coal dust

Prevention of pneumoconiosis

1- Dust control:

- Extraction of dust once formed during industrial process by local exhaust ventilation system, the most effective measure
- Fine water – spray by special devices

2- segregation of dusty process and automation of work if possible

3- Personal protection by masks or respirators

4- Health appraisal of exposed workers

- pre-placement medical examination
- Periodic medical examination
- Screened cases could either return to same work, with precautions and supervision or shift to other work , according to medical decision

2- Metals

Lead poisoning : may arise from inhalation or ingestion of dust or fumes in printing , painting , glazing of pottery and other industries.

Clinical picture:

1- Gastrointestinal: colic, constipation, vomiting, blue line of gums

2- Nervous system: peripheral neuropathy &nerve palsy

3- Blood picture: anemia

4- Renal : long continued exposure causes chronic intestinal nephritis

5- Reproductive: spontaneous abortion

2- Metals

Manganese poisoning:

- Manganese is used in manufacture of dry batteries and alloys especially fero-manganes used in steel industry
- Manganese dust is inhaled, absorbed from the lungs and deposited in different organs causing chronic poisoning and disability
- After around 2 years of exposure , the case shows extra pyramidal manifestation & pneumonitis

2- Metals

Berylliosis

- Berylliosis is a silvery white metal used in generation of atomic energy , preparation of alloys
- Exposure of workers to dust or fumes causes berylliosis with either :

Acute poisoning involving skin , conjunctiva and respiratory tract

Chronic poisoning: slowly progressive generalized granulomatosis involving the lungs, liver, kidneys

Prevention of Metal Poisoning

- **Local extraction** of dust, fumes, and vapors at site of formation , **by external ventilation**
- **Protection of workers** by:
  - Clothing , respirators, gloves & goggles
  - No food nor smoking in the workplace
- **Health appraisal periodic examination**

3- Gases

1- Simple asphyxiant: relatively inert gases that act by replacing air so that oxygen content becomes insufficient to support life, thus resulting in suffocation e.g. carbon dioxide and ethane

2- Chemical asphyxiant: gases interfere with oxygen –carrying function of blood through combination with or haemolysis of hemoglobin .

- They prevent oxygenation of tissue cells causing asphyxia as Co

3-Respiratory irritant:

- **Immediate effect:** halogens, sulpher dioxoide, ammonia
- **Delayed effect:** phosgene and nitrous fumes

4- Toxic gases: causing systemic toxic effect on different parts of the body . e,g, arsine & phosphine

3- Biological Agents

Occupational infection may arise from:

- Contact with diseased animals
- Contact with infected or contaminated materials
- Inhalation infection

Examples: Anthrax, tetanus, brucellosis , psittacosis

Industry related infection:

- Poor living conditions & unsanitary work environment , e.g. pulmonary TB, hepatitis A
- Exposure to silica dust ----silicosis----pulmonary TB

4- Accidents

Causes of work injuries

Factors related to the work

A- Personal factors : age, sex, health status

B- Unsatisfactory performance of work:

- Inadequate training and experience
- Non following safety rules
- Fatigue
- Non usage of personal protective devices
- Lack of careful supervision

4- Accidents

Factors related to management of the industrial Establishment

- Safety measures and rules not fulfilled: for fire, electric hazards
- Workplace: crowded, unclean floor
- Machines: not safeguarded
- Excessive noise, causing irritability

Factors related to the work environment

- Unsafe building
- Bad ventilation of workplace
- Improper lighting
- Slippery floor
- Lack of maintenance of floor , ladders, walls

Prevention of Accidents

1-Pre employment medical examination

2-Periodic medical examination and screening tests

- Health appraisal
- Early detection in reversible stage
- Indicators of occupational health

3-Personal protective devices and safety measures

4-Health education

- Pre employment and periodic teaching and training of worker technical knowledge, skills

5-Sanitation of the work environment by

- Proper design and construction of building
- Adequate ventilation & lighting
- Safe floor

6-Management of the work establishments

7-Prevention of fatigue at work

8-Health promotion

Control of work Injuries

- **First Aid and emergency services** for work injuries, at the workplace, and referral if necessary
- **Proper management of cases**
- **Cases with disability**: rehabilitation
- **Study of cases:** social investigation & medical examination

Occupational Health Program

Components:

I- Health Promotion

1-Socioeconomic promotion

- Reasonable income
- Social guidance and supervision to eliminate faulty habits

2- Adequate Nutrition: hot meals, milk, or snacks

- Nutrition education for workers
- Prevention & control of parasitic diseases
- Regular health appraisal to diagnose & manage

3- Sanitary environment

Living Environment: providing living accommodations for workers with good housing condition

Work environment:

- **Industrial plant:** proper site,design, with safe water supply
- **Work place:** adequate area, ventilation, lighting, spacing and safety machines
- **Toilet & washing facilities**
- **Wastes:** sanitary disposal of wastes with strict precautions

4- Mental Health promotion:

- Social welfare & activities
- Promoting social relation between worker-worker & worker-staff
- Study and management of social problems

Occupational Health Program

II- Prevention of Health Hazard

- Health promotion
- Health Education
- Effective health services

III- Health Apprasial

Goal: place the worker in a suitable job

Objective:

- Case finding
- Follow up for health status
- Health education and counseling for workers
- Statistical value

Occupational Health Program

III- Health Appraisal

A- Comprehensive Medical Examination

I- pre-placement Medical Examination

Components of examination:

1-Systemic physical examination

2-Investigation:

a-Routine investigation: chest radiography, blood for hemoglobin & ABO group, urine analysis, stool for parasites

b- Special investigations: blood picture, liver function tests

3- personal interview

Occupational Health Program

II- Periodic Medical Examination: is repeated at periodic intervals, recommended to be every three years

B- Screening Test: applied to screen cases for early detection of pathological changes

C- Clinical (Curative) Services

- Workers in industry are covered by “health insurance service”

D- Rehabilitation

- To minimize disabling effect & limitation
- To help the worker to return to his/her job

Occupational Health Program

IV- Health Education

- Personal cleanliness
- Principles of healthful lifestyle
- Requirements of health promotion (adequate nutrition)
- Basic knowledge about prevention & control of diseases

V- Monitoring & Evaluation

Health records: for each worker include the data of the medical examination conducted during the pre-placement & periodic examinations

Services statistics: the No. of workers examined per month, categorized by diagnosis

Special studies: survey studies, cohort studies, case control studies

Occupational Risks for Medical Professionals

1- Physical hazards: due to exposure to radiation (physiotherapy, radiotherapy)

2- Chemical hazards: handling chemicals, used in disinfection and sterilization cause contact dermatitis

3- Biological hazards:

- **Inhalation infection:** contact with cases of respiratory infection
- **Contact infection:** on handling infective or contaminated materials

4- Associated non occupational risk factors & hazards: worry, stress, tension of work, fatigue, faulty lifestyle

Occupational Risks for Farmers & Agriculture Workers

1- Work injuries : by articles & machines

2- occupational morbidity

Physical exposure:

- Prolonged exposure to heat & sun rays in hot months may cause sunstroke
- Ultraviolet rays of the sun affect the skin & eyes
- Long time exposure for years may cause skin malignancy

Chemical exposure: insecticides , empty containers may be re-used for filling water or other purposes

Occupational Risks for Farmers & Agriculture Workers

Biological exposure:

- **Inhalation infection :** pulmonary tuberculosis
- **Contact infection:** dermatophytoses, wound infection
- **Parasitic diseases:** schistosomiasis & ancylostoma
- **Allergy:** inhalation of biological allergens in air as pollen , animal hair
- **Farmers' lung**