The Dimensions Of Public Health

It would be useful to explore the concepts contained in the four terms that are commonly used to describe different aspects of public health

* **preventive medicine**
* **social medicine**
* **community health**
* **community medicine**

Preventive Mediecine:

Prevention is better than cure and it is one of the prime messages of public health. It differentiates public health from the clinical disciplines that are primarily involved with the care of the sick, whilst public health emphasizes the avoidance of illness:

1. **protective measure** like vaccination and improved nutrition that target only healthy people with the aim preventing the onset of disease.
2. **Early diagnosis and treatment** of sick persons with the aim of preventing advanced diseases and in the case of communicable diseses, in preventing the spread within the community.
3. **The treatment of sick individuals aimed** at revising damage and restoring function.

Social Medicine

'The poor die young' The rise of social medicine coincided with increasing realization of the links between social status and the health of individuals and communities. Statistical analysis of mortality and morbidity data show strong correlation between the social stratification in society and pattern of health and disease.

The objective of social medicine is to identify the social determinants of health and disease in the community and to devise mechanisms for alleviating suffering and ill health through social policies and actions. Social medicine is based on certain fundamental assumptions:

* Health as a birthright.
* The responsibility of the state.
* Development and health are inter-related.
* Education promotes health.
* Social factors have a profound influence on health.
* Health begins at home.

Key Public Health Functions

Public health services perform a wide range of functions, which can be classified as four key elements:-

1. assessing and monitoring of the health of the population.
2. planning, implementing and evaluating public health programs.
3. identifying and dealing with environmental hazards.
4. communicating with people and organizations to promote public health.

Epidemiology :-

In its modern usage, the term epidemiology refers to the study of the distribution of disease in human populations, against the background of their total environment. It includes a study of the patterns of disease as well as a search for the determinants of disease. The modern definition of epidemiology includes:

1. All diseases:
   a: communicable disease viral, bacterial , protozool etc
   b : non communicable disease such as cancer , malnutrition , accidents and others.
2. Populations epidemiology deals with Disease distribution in population while medicine concerned with feature of disease in individual.

Epidemiology Of Communicable Disease

The components of communicable disease

Communicable disease are characterized by the existence of a living infectious agent which is transmissible. A part from the infectious agent, two other factors, the host and the environment, affect the epidemiology of the infection. The relationship between these three components may illustrated using the following analogy:

Infections Agents:-	The seed
Host:	The soil
Route of transmission:	The climate

Infectious Agents

These may be viruses, rickettsia, bacteria, protozoa, fungi or helminthes. The biological properties of the agent may play a major role in its epidemiology.

In order to survive an infectious agent must be able to do the following:

1- multiply.

2- emerge from the host.

3- reach a new host.

4- infect the new host.

Knowledge of the mechanism that the organism uses at each of these four stages may help in identifying the most weaken stage at which to direct control measures.

The ability of the infective agent to survive in the environment is an important factor in the epidemiology of the infection. The term reservoir of infection, is used to describe the specific environment niche upon which it depends for its survival. The reservoir may be

1-Human
2- Animal
3-Non-living material

For some infective agents, the reservoir may include serveral elements. The infective agents lives and multiples in the reservoir from which it is transmitted to other habitats but cannot survive indefinitely at these other sites. For example, from its human reservoir, Salmonella typhi the cause of typhoid fever, can contaminate water supplies, milk and other

food products and can infect susceptible hosts. Since the bacilli cannot survive indefinitely in these habitats, these other sites do not represent the reservoir of typhoid infection but serve as a source of infection.

Human Reservoir

This includes a number of important pathogens that are specifically adapted to man – the infective agents of measles, AIDS, typhoid, meningococcal meningitis, gonoorrhoea and syphilis. The human reservoir includes both ill persons and healthy carriers. In some cases (e.g. salmonellosis) humans share the reservoir with other animals.

1. Carriers

A carrier is a person who harbors the infective agent without showing signs of disease but is capable of transmitting the agent to other persons. Different types of carriers are described depending on when they excrete the organism in relation to the illness:

1. A healthy carrier: remains well throughout the infection.
2. An incubatory or precocious carrier: excretes the pathogens during the incubation period, before the onset of symptoms (e.g. HIV / AIDS)or before the characteristic feature of the disease (e.g. the measles rash or glandular swelling in mumps) are manifested.
3. A convalescent carrier: continues to harbor the infective agent after recovering from the illness. The carrier may excrete the agent for only a short period, or may become a chronic carrier, excreting the organism continuously or intermittently over a period of years.

2. Animal Reservoir

Some infective agents that affect humans have their reservoir in animals. The term zoonosis is applied to those infectious diseases of vertebrate animals which are transmissible to man under natural conditions:

1. Where humans use the animal for food, e.g. taeniasis.
2. Where there is a vector transmitting the infection from animals to humans; e.g. plague (flea), viral encephalitis (mosquito).
3. Where the animal bites human beings, e.g. rabies.
4. Where the animal contaminates human environment including food, e.g. salmonellosis.

3. Non-living reservoir

Many of these agents are saprophytes living in soil and are fully adapted to living free in nature. The negative forms are usually equipped to withstand marked changes in environmental temperature and humidity. In addition, some develop resistant forms such as spores which can withstand adverse environmental conditions, for example clostridial organisms-the infective agents of tetanus (Clostridium tetani), gas gangrene (C. welchii) and botulism (C. botulinum).

The source of infection

This term refers to the immediate source of infection; that is, the person or object from which the infectious agent passes to a host. This source of infection may or may not be a portion of the reservoir. For example human beings are the reservoir of shigella infection; a cook who is a carrier may infect food that reserved at a party; that item of food, rather the reservoir is the source of infection in that particular outbreak.

Route of transmission

This refers to the mechanism by which an infectious agent is transferred from one person to another or from the reservoir to a new host. Transmission may occur by:

1. Contact, either directly, persons to persons or indirectly through contaminated objects (fomites). Penetration of skin. Directly by the organism itself (e.g. hookworm larvae, schistosomiasis), by the bite of a vector (e.g. malaria, plague) or through wounds (e.g. tetanus).
2. Inhalation of air-borne infections, Poor ventilation, over-crowding in sleeping quarters and in public places are important factors in the epidemiology of air-borne infections.
3. Ingestion, from contaminated hands, food or water.
4. Transplacental infection. Some infective agents cross the placenta to infect the fetus in the womb, producing congenital infections (e.g. HIV, syphilis, toxoplasmosis).

For some infective agents, infection occurs through more than one route of transmission. For example, plague is transmitted by flea bite (bubonic plague) but in some cases, direct person to person transmission occurs through the respiratory route (pneumonic plague).

Host Factors

The occurrence and outcome of infection are in part determined by host factors. The term immunity is used to describe the ability of the host to resist infection. Apart from determining the occurrence of infection, the host's immune responses also modify the nature of the pathological reaction to infection. Allergic reactions in response to infection may significantly contribute to the clinical and pathological reactions. Resistance to infection is determined by non-specific and by specific factors.

1. natural Immunity :-

This depends on the protective covering of skin which resist penetration by most infective agents, and the mucous membranes, some of which include ciliated epithelium which mechanically scavenges particulate matter. Certain secretions- mucus, tears and gastric secretions-contain lysozymes which have antibacterial activity; in addition, the acid content of gastric secretion also has some antimicrobial action.

Reflex responses such as coughing and sneezing also assist in keeping susceptible parts of the respiratory tract free of foreign matter.

If penetration has occurred, the organisms may be eliminated through the actions of macrophages and other cells or through the effects of non-specific serological factors.

2. Acquired immunity :-

Specific immunity may be due to genetic or acquired factors.

I- Genetic Factors

a. Certain organisms that infect other animals do not infect humans, and vice versa. This species specificity is, however, not always absolute and there are some infective agents which regularly pass from animals to human beings (zoo noses).
b. There are also variations in the susceptibility of various races and ethnic groups, for example some people of African origin tend to have a high level of resistance to vivax malaria infection.
c. Specific genetic factors have been associated with resistance to infection, for example persons who have hemoglobin S are more resistant to infection with Plasmodium falciparum than those with normal hemoglobin AA.

II. Acquired Factors

Acquired immunity may be active or passive. In active immunity the host manufacture antibodies and develops other protective mechanisms including cellular immunity, in response to an antigenic stimulus. In passive immunity, the host receives performed antibodies.

Active immunity may be naturally acquired following clinical or subclinical infection; or it may be induced artificially by administering living or killed organisms or their products (vaccines).

The new-born baby acquired passive immunity by the transplacental transmission of antibodies; in this way the newborn babies of immune mothers are protected against such infections as measles, malaria and tetanus in the few months of life. Passive immunity is artificially induced by the administration of antibodies from the sera of immune human beings or animals.

Factors Affecting Host Immunity

The resistance of the host to infection is affected by such factors as age, sex, pregnancy, nutrition, trauma and fatigue. Certain infections (e.g. HIV, the etiological agent of AIDS), some systemic diseases (e.g. diabetes mellitus, nephritic syndrome) and immunosuppressive therapy may also reduce the resistance of the host.

1. Age

For some infections, persons at both extremes of age tend to be most severely affected (i.e. children and the elderly). Some infections predominate in childhood: this usually occurs in situations in which most children become infected and thereby acquire lifelong immunity.

2. Sex

Some infective disease show marked differences in their sex incidence; this is apart from infections which specially affects the genital and sex organs infections such as poliomyelitis and diphtheria often show a preponderance in females.

3. Pregnancy

Pregnancy increases susceptibility to certain infectious these occur more frequently, show more fever manifestations and have a worse prognosis than in non-pregnant women of a similar age group for example viral infections such as poliomyelitis, bacterial infections such as malaria and amoebiasis.

4. Nutrition

Good nutrition is generally accepted as an important measure in enhancing resistance to infection. Severe specific deficiency of vitamin (A) renders the cornea and the skin more liable to infection.

5. Trauma and fatigue

Trauma and fatigue may render the host more susceptible to infections. One classical example is the effect of trauma and fatigue on poliomyelitis.

Measurements taken by public health authorities :

I. Herd immunity

The level immunity in the community as a whole determined 'herd immunity. When herd immunity is low, introduction of the infection is lead to severe epidemics. For example, the introduction of measles into an island population which had no previous experience of the infection resulted in massive epidemics. On the other hand, when herd immunity is high, the introduction of infection may not lead to a propagated spread.

II. Notification Of Diseases

A modifiable disease is one the occurrence of which must be reported to the appropriate health authority. The group includes the major epidemic diseases and other communicable diseases about which the health authorities require information.

III. Identification of the source of infection

Epidemiological investigation are directed to finding the source of infection. This involves analysis of the information about the time sequence of the occurrence of cases and the history of the movements of the patients.

V. Incubation Period and prodromal period

The incubation period, defined as the time from infection of the host to the first appearance of symptoms, is in practice taken from time of first ex36posure, which is easier to determine.

The Prodromal period is the interval between the onset of symptoms and appearance of clinical manifestations, for example in measles infection, the symptoms of fever and coryza will occur within 10 days of exposure (incubation period)with the characteristic rash appearing about 4 days later (prodromal period).

Knowledge of the incubation period is also helpful in identifying whether an outbreak has resulted from a simple common exposure (a point source epidemic) or from multiple sources.

Certain infections can be prevented by immunization of the host during the incubation period:

1. Passive immunization with immunoglobulin can prevent or modify an attack of measles in a child who has been in contact with the infection.
2. Active immunization early in the incubation period can protect those exposed to the risk of infection-as for possible exposure to rabies.

VI. Methods of Control

There are three main methods of controlling a communicable disease:

1. Eliminate reservoir of infection.
2. Interrupt the pathway of transmission.
3. Protect the susceptible hosts.

1. **Elimination of the reservoir**

   A. **Human Reservoir**

   Isolation of patients
   Quarantine
   The zoo noses

   B. **Non-Living Reservoir**

   Where the reservoir is in soil, elimination of the reservoir is not feasible but it may be possible to limit man's exposure to the affected area, for example in some areas, infection with Histoplasma capsulatum occurs in persons who go into bat-infected caves. Such exposure can be avoided.

2. **Interruption of transmission**

   This mostly involves improvement of environmental sanitation and personal hygiene. The control of vectors also depends largely on alterations in the environment and, in addition, the use of pesticide agents.

3. **Protection of the susceptible host**

   This may be achieved by active or passive immunization. Protection may also be obtained by the use of antimicrobial drugs, for example chemoprophylaxis is used for the prevention of malaria, meningococcal meningitis and bacillary dysentery. Any vaccine or drug used for a mass campaign must be effective, safe, cheap and simple to apply. Following the emergency operation of a mass campaign, the programme should be integrated into the basic health services of the community.

Epidemiology Of Non-Infectious Diseases

1. Nutritional disorders (scurvy, beriberi, pellagra, dental caries, goiter).
2. Cancer(skin, lungs, cervix, uteri, breast, bladder, leukaemia).
3. Congenital abnormalities (Down's syndrome, thalidomide poisoning).
4. Intoxications (chronic beryllium poisoning, alcoholic cirrhosis).
5. Mental illness (postpartum psychosis, neuroses, suicide).
6. Accidents (home, road and industrial accidents)
7. Degenerative disease (tropical neuropathy, coronary artery disease, hypertension, arthritis).

Risk Factors

The concept of risk factors is increasingly used in the study of non-communicable disease. For example many factors are associated with the occurrence of ischemic heart disease including diet, exercise, and the use of cigarettes.

In some cases the risk factors relate directly to etiological factors (cigarette smoking and cancer of the lung) but in other cases the risk factor identified may be a convenient, easily identified and measured indicator of an underlying etiological factor.