Public Health
Pharmacy college
4th stage
Lec 1

Dr. Noor Hassoon

Public Health Definition

Public health is a science that focuses on protecting and improving the health of entire populations rather than treating individual patients clinically.



Core Components of Public Health

- **Epidemiology:** Tracking disease patterns, distribution, and determinants in a population.
- **Biostatistics:** Utilizing data models to forecast outbreaks and evaluate health program efficacy.
- **Environmental Health:** Guarding against physical, chemical, and biological threats in our surroundings.
- **Health Policy & Management:** Administering healthcare delivery systems and implementing population-level regulations

Epidemiology

- **Epidemiology** refers to the study of the distribution of disease in human populations, against the background of their total environment.
- Modern definition of epidemiology includes three important elements:

1- All **diseases** included (communicable and non-communicable diseases).

2- Populations:- Epidemiology deals with the distribution of disease in populations, communities or groups.

3- Ecological approach:- The occurrence of disease is examined in terms of the interrelationship between human beings and their total environment.

Epidemiology Purposes

(i) Understanding disease dynamics.
(ii) Controlling disease.
(iii) Promoting health.

DISEASE DISTRIBUTION

Three major questions are usually asked in epidemiology:-

- Who?
- Where?
- When?

Answers to these questions provide indications to the factors which determine the occurrence of the disease.

Some of the variables used to describe the distribution of disease in epidemiology:-

- ✓ **People :-** Age, sex, Race, ethnic group,religion, occupation, education, Personal habits – use of alcohol and tobacco.
- ✓ **Place :-** Country, region, state, district local community, city wards.
- ✓ **Time :-** Year, season, day, periodic changes,seasonal variations .

EPIDEMIOLOGICAL METHODS

- The basic tool of epidemiology is the **rate** – it relates the number of cases to the population at risk.
- There are **two** main types of rates are calculated.

1. INCIDENCE RATE

- This indicates the occurrence of new cases within a stated period:

Incidence rate=(No.of new cases in started period/population at risk).1000

2. POINT PREVALENCE RATE

- This is the number of cases that are present within the population at a particular point in time:-

PREVALENCE RATE=(No.of current cases at aspecific time/population at risk).1000

Analytical epidemiology

Two types of study are employed:

1- CASE-CONTROL STUDIES

Case-control studies (also known as retrospective studies or case-history studies), a group of affected persons is compared with a suitably matched control group of non-affected persons.

Case-Control Study Example (Outcome → Exposure)

- **The Setup:** You find **100 patients** in a hospital who already have lung cancer (Cases) and **100 patients** in the same hospital who do not have lung cancer (Controls).
- **The Process:** You look backward at their medical histories or interview them about their past habits.
- **The Result:** You calculate how many people in the cancer group used to smoke versus how many in the healthy group used to smoke.
- **What it tells you:** It calculates the **odds** that a person with lung cancer was a smoker in the past compared to someone without it.

2- COHORT STUDIES

For cohort studies, a group of persons who are exposed to the suspected aetiological agent are compared with matched control subjects who have not been similarly exposed.

Cohort Study Example (Exposure → Outcome)

- **The Setup:** You find **1,000 healthy people** who currently smoke (Exposed) and **1,000 healthy people** who do not smoke (Unexposed).
- **The Process:** You follow both groups forward in time for **20 years**.
- **The Result:** At the end of the study, you count how many people in each group developed lung cancer.
- **What it tells you:** It directly calculates the **incidence of disease** and the actual risk of getting cancer if you smoke.

Case control studies VS Cohort studies

- Compared with cohort studies, case-control studies have the advantage of being relatively quick, easy and relatively inexpensive. A significant number of cases can be assembled for the case-history study and a variety of hypotheses can be rapidly screened.

Importance of epidemiology in public health

- **Epidemiology is considered the foundational science of public health.**
- It provides the data, tools, and tracking methods necessary to understand health patterns across whole populations and make informed decisions to protect communities.

Infectious diseases and development

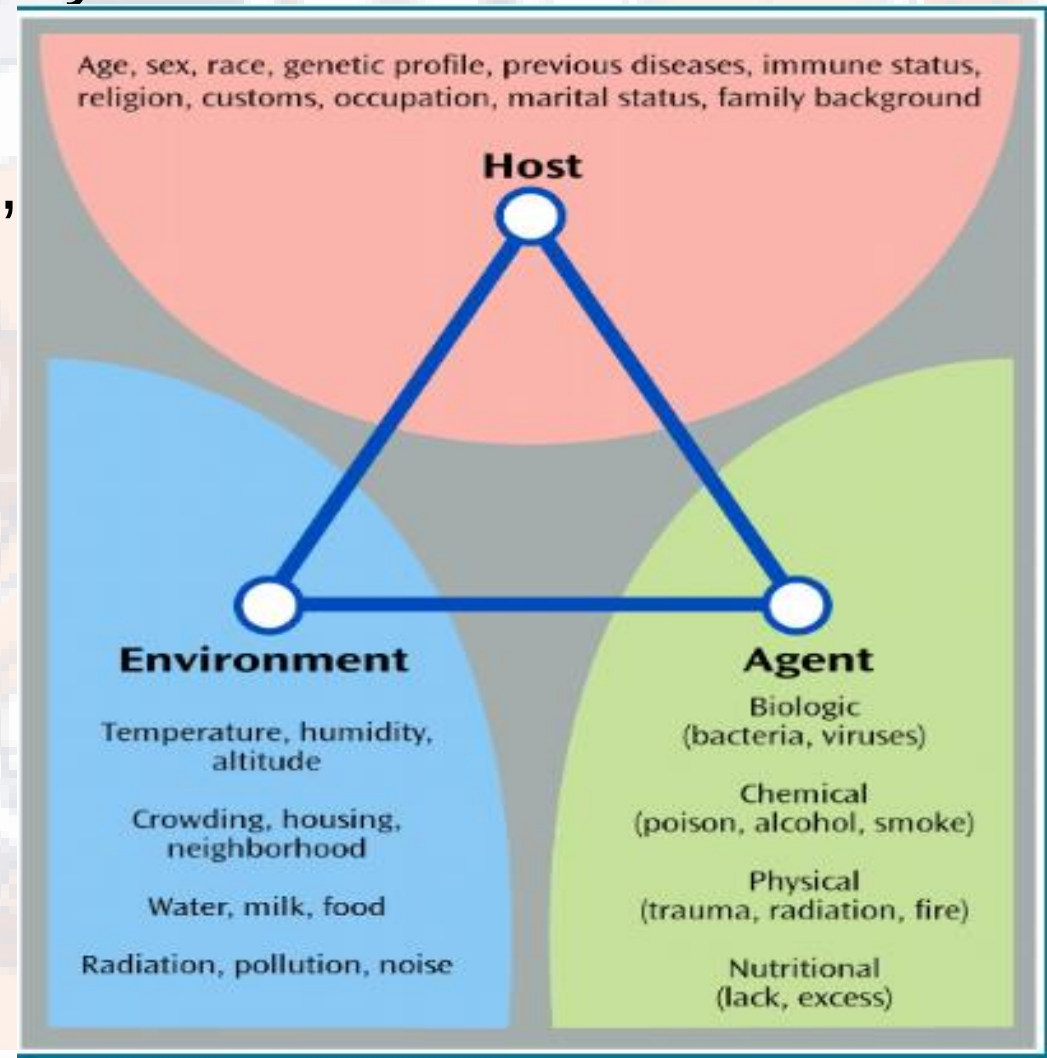
Changes in land and water use, deforestation, agricultural development, dams and irrigation schemes can have major positive or negative impact on the pattern of disease .

So, large outbreaks of communicable diseases periodically occur worldwide.

EPIDEMIOLOGY OF COMMUNICABLE DISEASES

THE COMPONENTS OF COMMUNICABLE DISEASE

- Communicable diseases are characterized by the existence of a living infectious agent which is transmissible. Apart from the infectious agent, two other factors, the host and the environment, **affect the epidemiology of the infection.**



INFECTIOUS AGENTS

- These may be viruses, rickettsiae??, bacteria, protozoa, fungi or helminthes. In order to survive an infectious agent must be able to do the following:
- Multiply.
- Emerge from the host.
- Reach new host
- Infect new host
- The ability of the infective agent to survive in the environment is an important factor in the epidemiology of the infection.

Reservoir of infection

- A **reservoir** is defined as the natural habitat where an infectious agent lives, grows, and multiplies.
- The reservoir may be human, animal or non-living material.

1- human reservoir

- The human reservoir includes both ill persons and healthy carriers.

Carriers

- A carrier is a person who harbours 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:-

❑**A *healthy carrier* :-** Remains well throughout the infection.

❑**An *incubatory* or *early carrier:-*** excretes the pathogens during the incubation period, before the onset of symptoms (e.g. HIV/AIDS) or before the characteristic features of the disease (e.g. the measles rash or glandular swelling in mumps) are manifested (appeared).

❑**A *convalescent carrier:-*** continues to harbour the infective agent during and 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:-

- Where humans use the animal for food.
- Where there is a vector transmitting the infection from animals to humans, e.g. plague (flea),viral encephalitis (mosquito);
- 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 vegetative 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 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.

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, person to person, or indirectly

through contaminated objects

2- Penetration of skin, directly by the organism itself (e.g. hookworm larvae, schistosomiasis), by the bite of a vector (e.g. malaria) or through wounds (e.g. tetanus).

3- Inhalation of air-borne infections.

4- Ingestion, from contaminated hands, food or water.

5- *Transplacental infection*, Some infective agents cross the placenta to infect the fetus in the womb, producing congenital infections (e.g. HIV, syphilis, toxoplasmosis).

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**.
- The Resistance to infection is determined by non-specific and by specific factors.

- **Non-specific resistance**

a. Protective covering of skin.

b. Mucous membranes:

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.

c. Reflex responses such as coughing and sneezing

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

- **Specific immunity**

Specific immunity may be due to genetic or acquired factors.

✓**GENETIC FACTORS**

Specific genetic factors have been associated with resistance to infection, for example persons who have haemoglobin **S** are more resistant to infection with *Plasmodium falciparum* than those with normal haemoglobin **A**.

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.

✓ACQUIRED FACTORS

Acquired immunity may be active or passive:

- In active immunity the host manufactures **antibodies** and develops other protective mechanisms including cellular immunity.
- Active immunity may be naturally acquired following clinical or subclinical infection; or it maybe induced artificially by administering living or killed organisms or their products (vaccination).

- In passive immunity, the host receives preformed antibodies.
- The new-born baby acquires 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 first few months of life.
- Passive immunity is artificially induced by the administration of antibodies from the sera of immune human beings(**homologous**) or animals (**heterologous**).
- Protection from passive immunity tends to be of short duration, especially when heterologous serum is used.


Thank you