

8<sup>th</sup> lecture:

# General Principles of Prevention and control of communicable diseases

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Lecture objectives:

**By the end of this lecture students will be able to:**

- ✓ Identify the levels of prevention of diseases
- ✓ Identify tools for intervention at each level.



## Headlines

- Levels of prevention
  - Primary
  - Secondary
  - Tertiary
- Interventions
  - Measures towards reservoir
  - Measures towards carriers
  - Measures to reduce host susceptibility

**Prevention:** Actions aimed at **eradicating, eliminating, or minimizing** the impact of disease and disability, or if none of these is feasible, retarding (because some diseases lack the tools such as medications and vaccines) the progress of **disease and disability**.

The concept of *prevention* is best defined in the context of *levels of prevention*; *primary, secondary*, and *tertiary prevention*. (Oxford Dictionary 2008)

**Elimination of disease :** Disease incidence is reduced to a minimal level at which the disease is no longer considered a public health problem, while infection may still occur.

Example: The aim of elimination of Neonatal tetanus is reduction of its incidence to less than one case/1000 live births.

**Eradication** (this is better than elimination)

It means **worldwide disappearance** of a disease (permanent reduction to **zero** level) with **complete destruction** of the agent.

- The organism can be present only in laboratories (just in case we needed to prepare vaccines later on) and no need for interventions.

e.g. **smallpox** “الجدري” eradication from the world since 1979

## Levels of Prevention

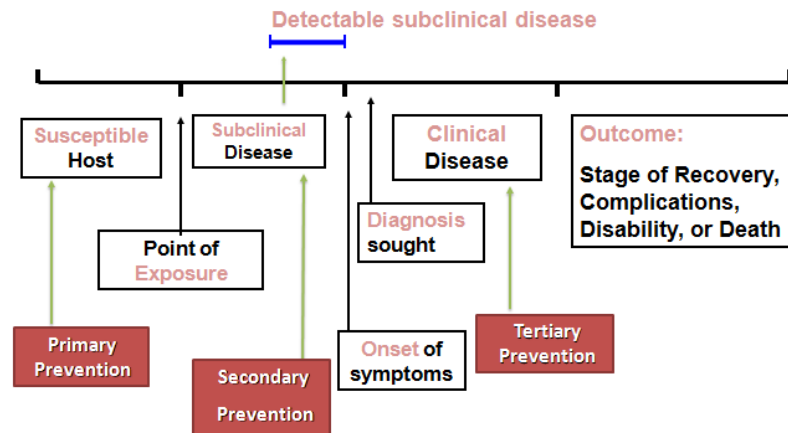
- Primary prevention → pre-event phase (before exposure)
- Secondary prevention → event phase (when the pathogenesis has started already)
- Tertiary prevention → post-event phase (after the appearance of the full features of the disease)
- **What to do?**
- *Health Promotion (1ry prevention) it means that we'll try to maintain the person's healthy status.*
- *Early detection & care (2ry prevention) if the person is already diseased, we'll focus on detection.*
- *Rehabilitation (3ry prevention) treat.*

## Natural History of Disease

\*susceptible host = healthy individual (best tool? apply primary prevention)

\*subclinical (incubation period in communicable diseases) best tool? Secondary prevention.

\*Clinical, best tool? Tertiary prevention.



### I- Primary Prevention:

- Actions taken prior to the onset (before exposure) of the disease which aim to remove the possibility that a disease will ever occur" ex: the use of vaccines.
- It limits the incidence of diseases by preventing healthy people from developing disease.

#### ✚ At individual level: Measures to improve the general health of the individuals:

1. Health education (general) efforts are directed at encouraging people to develop good health habits (Adequate nutrition, exercise) and to adopt hygienic practices (hand washing....etc)
2. Specific protective measures such as immunization, chemoprophylaxis...

#### ✚ At environmental level

**Environmental sanitation** is used to provide an adequate sewage system, safe drinking water, clean air and proper ventilation.

### II- Secondary Prevention:

It is the **early detection** and **prompt treatment** of a disease, thus hinder the progress of a disease and prevent complications. i.e. intervention in early pathogenesis phase.

Measures of secondary prevention include:

1. **Screening programs** are used to detect diseases at early preclinical stages, when effective therapy may either cure the disease or limit its progression
2. **Primary medical care:** through early case finding at PHCC (primary health care centre). It is the predominant form of secondary prevention.

### III- Tertiary prevention:

- Actions taken when the disease process has advanced **beyond its early stages** i.e. intervention in late pathogenesis phase.
- The aim of tertiary prevention is limitation of disability and rehabilitation from disease.
- Tools for tertiary prevention include **rehabilitation**

#### Rehabilitation includes:

1. **Medical rehabilitation** – restoration of function or physical loss.
2. **Educational rehabilitation** change of educational methods.

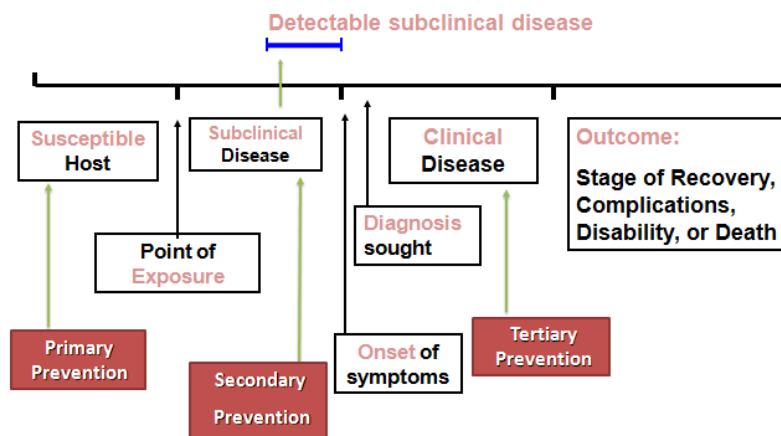
3. **Vocational (occupational) rehabilitation** – restoration of the capacity to earn a livelihood.
4. **Social rehabilitation:** restoration of family and social relationships.
5. **Psychological rehabilitation:** restoration of personal confidence.

### Examples of uses of levels of prevention

All three levels of prevention can be used to control a single disease process.

- ✚ Treating a person with acute communicable disease such as tuberculosis (secondary prevention) may prevent transmission to another person (primary prevention). In advanced cases of tuberculosis, occupational and social rehabilitation (tertiary prevention) by modification of working conditions may help to regain the capacity to earn his livelihood.

### Natural History of Disease



### Prevention & Control Measures of Communicable Diseases

#### Choice of appropriate prevention and control measures:

It depends upon the knowledge of:

- **Natural history**, disease causation and dynamics of disease transmission, (some diseases have a very short subclinical course which doesn't provide enough time for screening or early detection, here we must give vaccine before exposure if available)
- Identification of risk factors and high risk groups (for instance, if a certain disease affects children mainly, vaccines are going to target children before the rest of the community)
- Availability of tools of intervention (vaccine, chemoprophylaxis or treatment..)

In general, control measures should be directed to block the cycle of infection or the epidemiologic triangle at any of its three angles (agent, host, environment).

#### Interventions to break the cycle of infection

The best control measures to the first link, the **agent** are:

- To control the reservoir or source of infection to reduce the quantity of the agent.

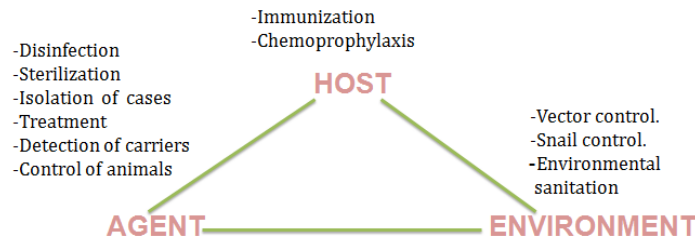
The best control measures to the second link, **MOT (mode of transmission)** are:

- To interrupt the transmission of the source of infection to the susceptible host.
- Examples are: Vector control, Snail control and improvement of Environmental sanitation.

The best means of control to the third link (the **host**) are:

- To improve the defense mechanism of the host by using proper Chemoprophylaxis, immune-prophylaxis or Vaccination.

### Disease Causation



### Examples:

### The Epidemiologic Triad

#### \*Measures Directed to the Reservoir

Measures applied to cases:

- Case finding (early diagnosis)
- Reporting
- Isolation; separation of infected persons from those not infected for the period of communicability.
- Treatment (Chemotherapy)
- Disinfection of contaminated objects with appropriate “enteric precautions,” “respiratory precautions,” “universal precautions”

#### \*Measures applied to carriers

- Detection of carriers: It is important in certain diseases e.g. Enteric fever.
- Exclusion from work: in certain occupations for example;
  - food handler (e.g. Typhoid carrier) or a
  - Teacher (e.g. Diphtheria carrier).
- Treatment for the carrier state.

#### \*Measures applied to animal reservoir

- Destruction of infected animals (in *rabies*, *plague*)
- Inspection or slaughtering (in *bovine tuberculosis*)
- Testing and Immunization (in *brucellosis*)
- Careful husbandry and sterilization of animal products (in *anthrax*).

**\*Measures to reduce transmission of gastrointestinal infections:****Measures to Interrupt the Transmission of Organisms**

Environmental Measures to prevent transmission of diseases by Ingestion of contaminated vehicles include:

- Purification of water
- Pasteurization of milk
- Inspection of food handlers & public food places
- Improvements in housing conditions, and
- Educating people in proper personal hygiene and hand washing.

**\*Measures to reduce transmission of respiratory infections:**

- Proper ventilation of public places & classrooms,
- Minimize close person to person contact (reduce overcrowding)
- Control of dust.

**\*Measures to reduce transmission of arthropod borne infections**

Measures to control (reduce or eradicate) the vector include:

- biological
- mechanical and
- chemical methods

**Measures to reduce host susceptibility****Measures to improve the defense mechanism of the host by using:**

- Chemoprophylaxis,
- Immune-prophylaxis,
- Vaccination.

**Measures to reduce host susceptibility**

a) Chemoprophylaxis: The administration of a chemical, including antibiotics, to prevent the development of an infection or to slow progression of the disease to a clinically manifest form. e.g.

1. Isoniazid (INH) for contacts of tuberculous patients.
2. Rifampicin for contacts of meningococcal meningitis.
3. Chloroquine for travelers to malaria areas.

b) Immune-prophylaxis (Passive immunization): anti-diphtheritic serum.

c) Vaccination (Next Lecture).

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