

Unit 2: Methods of Communicable Disease Control

Individual Assignment

1. Covid-19(corona viruses) Discuss the factors that contribute the Emerging of ncorona viruses
2. Elaborate the types of viruses that affect the respiratory organ

There are three principal methods of controlling communicable disease. It is based on infectious process cycle.

- 1. By attacking the source**
- 2. By interrupting the means of transmission**
- 3. By protecting the host**

Source



Means
of
Trans
missio
n



Host

1. ELIMINATION OF THE RESERVIOR.

A) Isolation of patients.

Isolation is indicated in the control of acute epidemic diseases such as cholera, or for chronic infection such as lepromatous leprosy isolation of **patients is indication** for infection which has the following epidemiology features.

- i) High morbidity and mortality.
- ii) High infectivity.
- iii) No significant extra – human reservoir.
- iv) Infection cases easily recognizable.
- v) No significant reservoir or carriers.

B) Quarantine This refers to the limitation of movement of persons who have been exposed to infection. The restriction continues for a period of time equal to the usual longest duration of the incubation period of the disease.

C) The Zoonoses. Where the reservoir of infection is in animals, the appropriate action will be **determined by the use fullness of the animals**, how intimately they are associated with man and the feasibility of the protecting susceptible animals.

D) Treatment of cases:-

Treatment of sub clinical cases and carriers

Mass treatment:- Where a high percentage of the population are known to have disease , it is sometimes advisable to treat everybody , without checking whether individuals have the disease or not

II. Interrupting Transmission

1. Environmental sanitation:

- Many organisms are able to spread through contaminated food and water, particularly
- those that are dependant on the faecal -oral route. *Other diseases are spread through refuse and dirty living conditions.* The airborne disease are more likely to spread when
- housing is inadequate and people live in crowded rooms ..

2. Personal hygiene: Many careless or dirty personal habits help to spread some diseases, particularly the contact and venereal diseases and those that may be spread by faecal contamination of hands , food and water

3. Vector control:-

Any organism that requires a vector, like a mosquito or snail for its transmission cycle may be affected if the vectors are killed off or reduced. Methods of vector control include altering the environment so that is unfavorable to the vector (e.g draining swamps) using toxic substances (e.g larvicide's) and using other living organisms that attack the vector (biological methods) e.g introducing snail - eating fish irrigation schemes to control schistosomiasis.

4. Disinfection and sterilization:-

These aim at destroying the organism when it is in the environment, e.g the use of the chlorine in wells, and sterilization of surgical instruments.

III Protecting the host

1. Immunization

- (a) Many people having a disease
(active natural immunization)
- (b) Giving vaccination to most of a
population (active artificial
immunization)

2. Chemoprophylaxis

3. Personal protection.

4. Better nutrition.

**Effective control of a disease is
most likely
when a combination of methods**

1. Attacking the source.
2. Interrupting means of transmission.
3. protecting the host are used at
same time.

Disease prevention

➤ Interrupt the progression of a disease

□ Aim

➤ To push back the level of detection and intervention to the precursors and risk factors of disease

➤ → *emphasis on preventive rather than curative*

The pyramid and iceberg of disease

Intervention

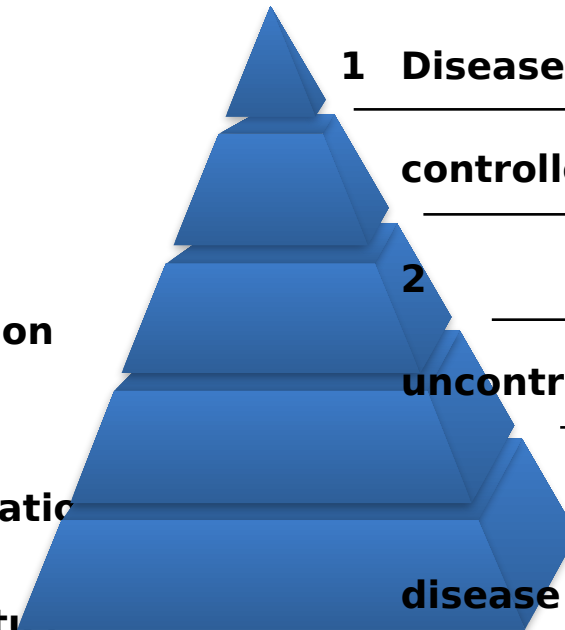
1 Nil, except observation

2 Review

3 Opportunistic or population screening

4 Screening or health education

5 Protection of current status (Health Promotion)



1 Diseased, diagnosed &

controlled

2 Diagnosed,

uncontrolled

3 Undiagnosed

disease

4 Risk

factors for disease

5

Free of risk factors

Levels of prevention:

1. Primary prevention.
2. Secondary prevention.
3. Tertiary prevention

Levels of Prevention

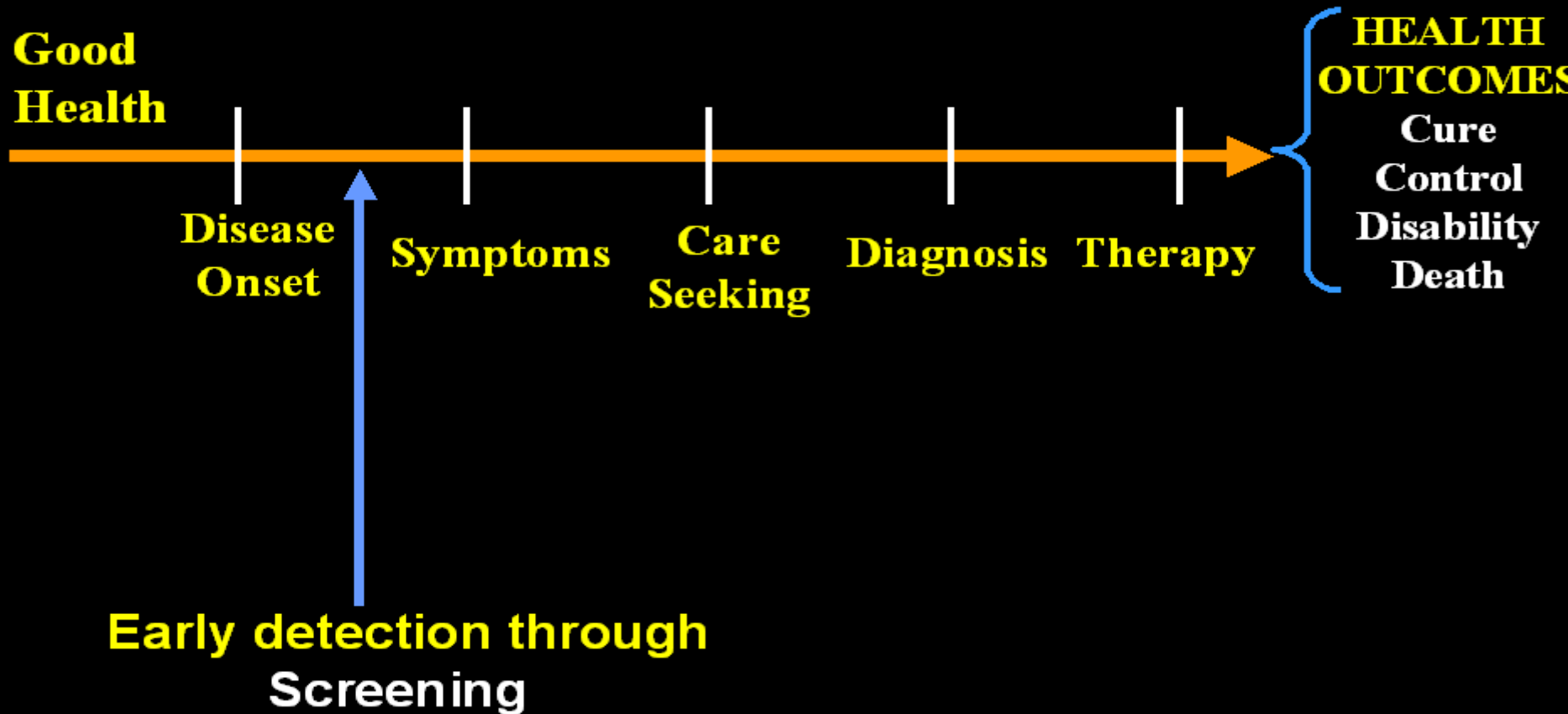
- Primary prevention => pre-event phase
- Secondary prevention => event phase
- Tertiary prevention => post-event phase

Promotion (1^o prevention)

Early detection & care (2^o prevention)

Rehabilitation (3^o prevention)

Early Intervention in the Natural History of Disease



1- Primary Prevention:

- Actions taken prior to the onset of the disease which aim to remove the possibility that a disease will “ever occur”
- It limits the incidence of diseases by preventing healthy people from developing disease.
- Tools for intervention include:
 - A. Health promotion
 - B. Specific protection

A. Health promotion

It is intended (proposed) to improve the general health of the individual and community through:

1. Adequate nutrition
2. Environmental sanitation
3. Personal hygiene
4. Health education
5. Socio-economic development
6. Genetic counseling ... etc.

B. Specific Protection

➤ is achieved through:

1. Specific immunizations (most important).
2. Chemoprophylaxis.

2 - Secondary Prevention:

- Actions that detect and treat disease at an early stage thus hinder(delay) the progress of a disease and prevent complications. i.e. intervention in early pathogenesis phase.
- To cure/ slow progression, prevent complication, reverse communicability of infectious diseases
- The tools employed for early diagnosis are:
 1. Screening for sub-clinical disease (either in screening surveys or in periodic medical examinations)
 2. Case finding (individual and

3 -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 to limit disability and prevent further complications or death.
- Tools for tertiary prevention include rehabilitation

Rehabilitation:

It is a measure to train disabled individuals to reach the highest level of functional ability by using combined coordinated medical, social, vocational, psychological and educational measures.

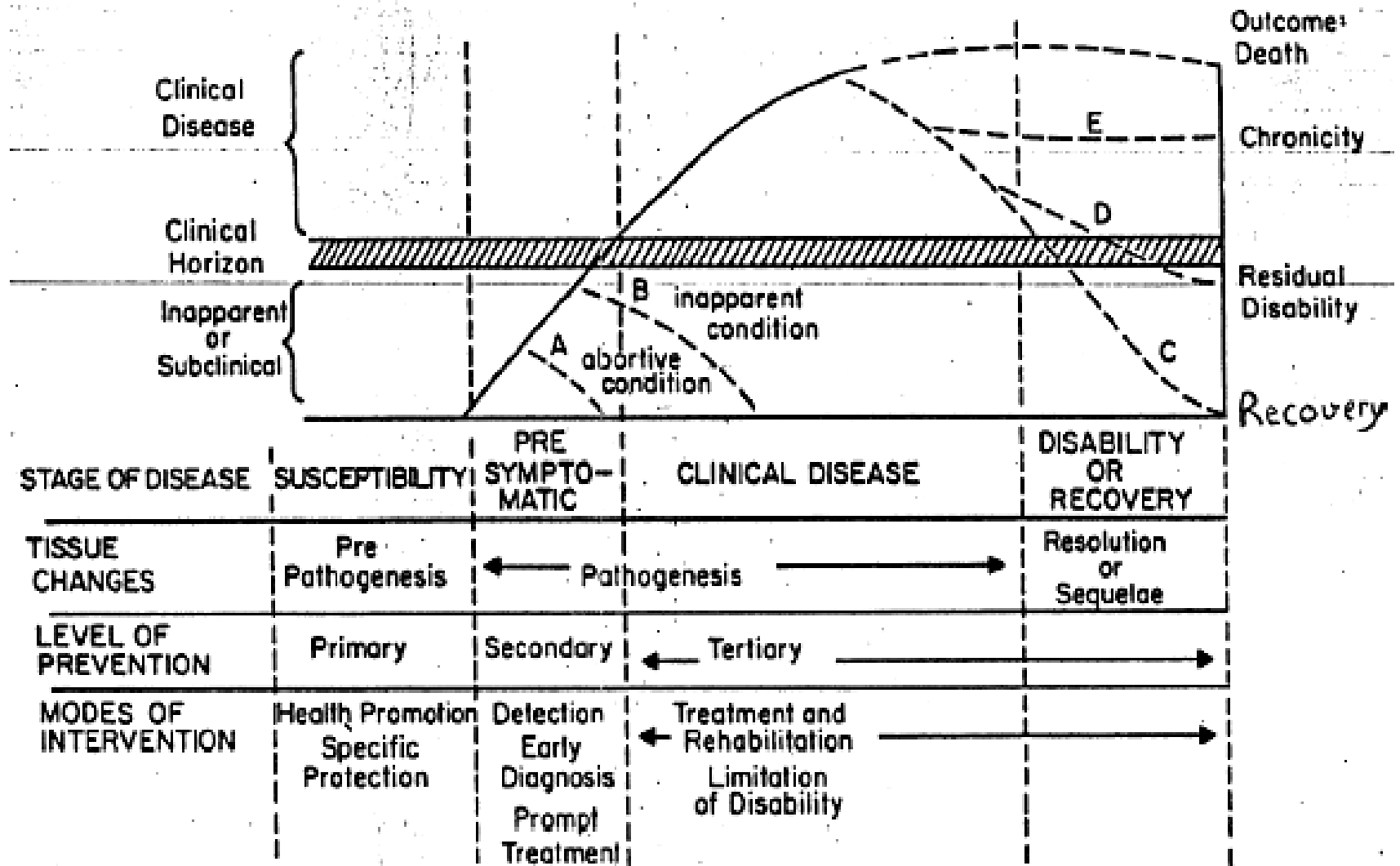
Rehabilitation comprises:

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 rehabilitation:

1. Special schools for blind individuals
2. Provision of aids for crippled.
3. Reconstructive surgery for leprotics.
4. Modification of life for tuberculous or cardiac patients.

Summary



• • • Schematic representation of the natural history of disease.

Control principles and methods

- Control principles can be directed at:
 - ✓ Agent
 - ✓ Route of transmission
 - ✓ Host
 - ✓ environment

1. The agent

- Destruction of the agent by specific treatment:
 - ✓ drugs that kill the agent in vivo
 - ✓ antiseptics, sterilization, incineration or radiation

2. Transmission

- Most vulnerable position for the agent
- **Quarantine:** limitation of freedom of movement of apparently healthy persons or animals who have been exposed to a case of infectious disease for the duration of the usual maximum incubation period of the disease.

eg:- Cholera, plague, small pox and yellow fever

≈ active surveillance of individuals

➤ ***Environmental health:***

- ✓ methods of personal hygiene,
 - ✓ water supplies and sanitation
- are particularly effective against all agents transmitted by the fecal-oral route whether by direct transmission or complex parasitic cycles involving intermediate hosts.

Isolation: separation of infected persons from those non-infected for the period of communicability.

- The use of isolation in the control of infectious diseases will be limited if there is a large number of inapparent infection.
- *Contacts: people who might have become infected because of their close proximity to a case.*

➤ ***Animals:***

- ✓ controlled by destruction or vaccination (e.g. against rabies).
- ✓ Inspection of carcasses for parasitic stages should be undertaken if the animals are to be eaten,
- ✓ Protective clothing and gloves should be worn during handling animals whose excretions or tissues could be infectious.

➤ ***Cooking:*** Hygienically proper preparation, handling, and storage of food.

➤ **Vector control:**

✓ parasite utilizes a vulnerable stage for development & transmission. Eg: larvicides

3. Host

Protected by physical methods
mosquito nets, clothing, housing
Vaccination / prophylaxis

4. Environment

Improved by:

- ✓ Education
- ✓ Assistance (agricultural advice, loans ...)
- ✓ Better communication (reach health facilities ...)

Control methods

- Several factors are incriminated for the widespread occurrence of infectious diseases in the developing countries:

- ✓ Levels of environmental hygiene
- ✓ Poor health service
- ✓ Inaccessibility to medical care
- ✓ Ecological and geographical condition

Specific control strategic measures

Directed :

- Against the reservoir of the organism
- To interrupt transmission of the infection
- To reduce the susceptibility of the host

Choice of appropriate method depends upon the knowledge of:

- causation and dynamics of disease transmission,
- identification of risk factors and high risk groups
- availability of tools of intervention (vaccine , chemoprophylaxis or treatment ...)

In general, control measures should be directed towards the link in the infection chain which is most susceptible to interference.

Cycle of infection and intervention applied at each link



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 in order to reduce the quantity of the agent.

The best control measures to the second link (MOT) are:

- to interrupt the transmission of the

- 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.

1. Measures Directed Against The Reservoir

A. Measures applied to cases

- Case finding (early diagnosis)
- Reporting
- Isolation
- Treatment (Chemotherapy)
- Disinfection of contaminated objects with appropriate “enteric precautions,” “respiratory precautions,” “universal precautions”

B. Measures applied to carriers

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

C. Measures applied to animal reservoir

- Destruction of infected animals (in *rabies, plague*)
- Inspection or slaughtering (in bovine Tb)
- Testing of herds and Immunization (in *brucellosis*),
- Careful husbandry and sterilization of

2. Measures directed against transmission of organisms

A. Action to prevent transmission of disease by ingestion of contaminated vehicles:

- ✓ Purification of water
- ✓ Pasteurization of milk
- ✓ Inspection and other procedures designed to ensure a safe preparation and supply
- ✓ Housing, nutrition and other social conditions ... in the reduction of sickness and death resulting from infectious diseases

B. Measures to reduce transmission of respiratory infection:

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

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

- biological
- mechanical and
- chemical methods

3. Measures which reduce host susceptibility

Non-specific measures:

- Measures to increase general resistance (Health education, Personal hygiene, Good standard of nutrition,...)

Specific measures:

- Use of specific passive and active immunization and

- **Active Immunization:** induces the production of antibodies by introducing the organism (live attenuated e.g measles and oral polio) and killed (pertusis).
- **Passive immunization:** transfer of antibodies to the host. It has a relatively lesser role in the control of infectious diseases. E.g. Administration of immune serum globulin (ISG) for the prophylaxis of measles, infectious hepatitis, tetanus antitoxin, antiserum against rabies

Examples of chemoprophylaxis:

1. *Isoniazid* for contacts of *tuberculous* patients.
2. *Sulphadiazine* or *Rifampicin* for contacts of *meningeococcal meningitis*.
3. *Erythromycin* or *penicillin* for unimmunized contacts of a *diphtheria* case.
4. *Tetracycline* for contacts of *cholera* and *pneumonic plague*.
5. *Chloroquine* for travelers to *malaria* areas.

Summary of control principles and methods

