

DISEASE PREVENTION AND CONTROL

General Principle of Prevention, Control, Elimination and Eradication of Communicable Diseases

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Disease control:

Is reducing the transmission of disease agent to such a low level that it ceases to be a public health problem

– ***It aims at reducing***

Incidence of the disease

Duration of the disease

Effects of infection

Financial burden to the community

Disease elimination:

Is complete interruption of transmission of disease in a defined geographical area, but the causative organism may be **persisting** in environment

Disease elimination is a 'geographical term', can be used only for a country or a region

Disease eradication:

Is complete '**extermination**' of organism.

Is '**tearing out by roots**' of a disease.

there is **complete interruption** of disease transmission in the entire area of the community–

Objective of eradication: Is to eliminate the disease to the extent that **no new case** occurs in the future

D. ***eradication is a 'global term'***, i.e. can be used only for whole planet

ONLY 1 disease till date: Small pox (declared eradicated on 8 May, 1980.)

NATURAL HISTORY OF DISEASE

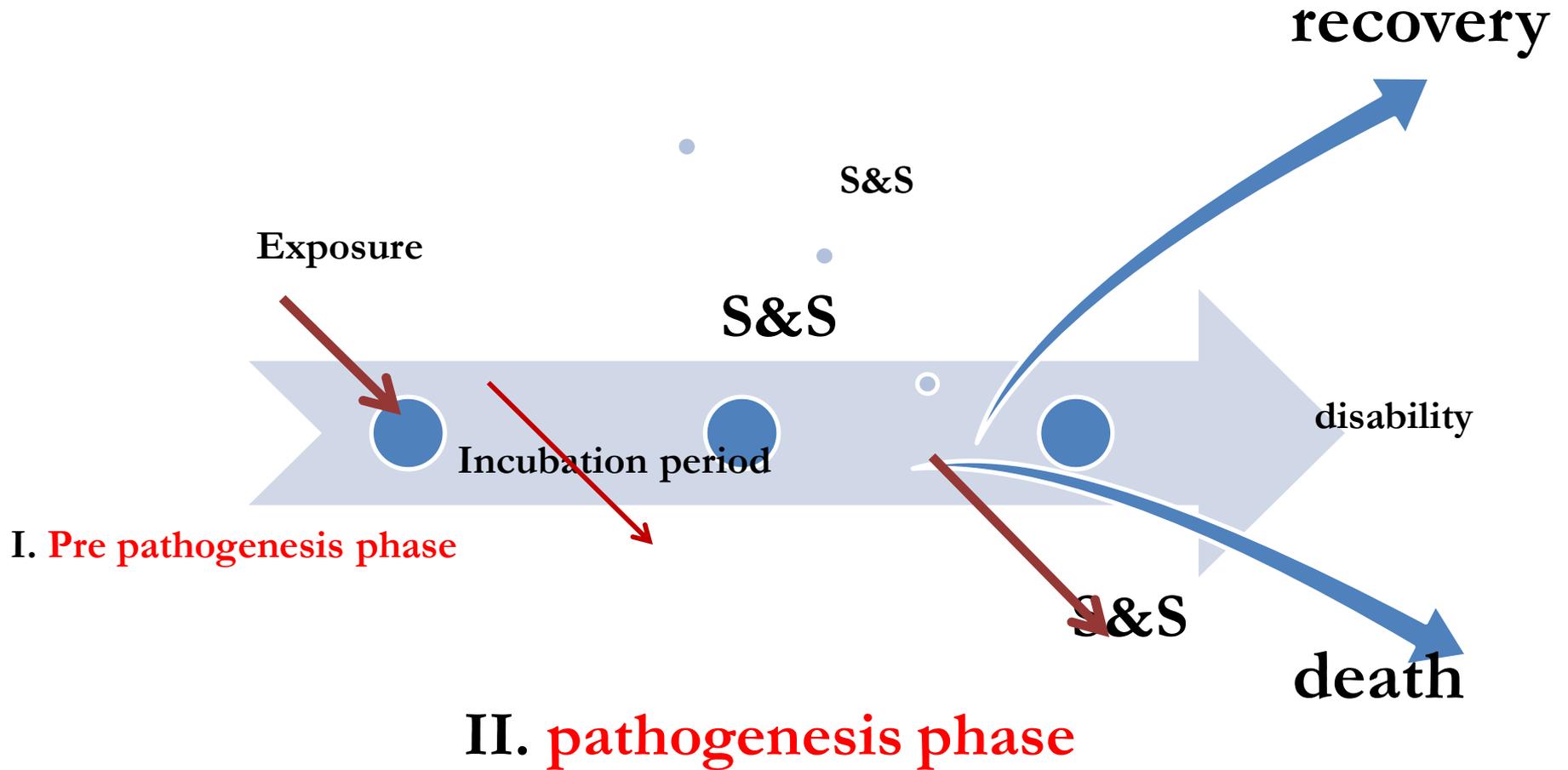
For the application of preventive measures it is a necessary to understand the pathogenetic chain of events for a particular disease.,

Disease results from a **complex interaction** between **man**, an **agent** and the **environment**.

The term *natural history of disease* is a key concept in epidemiology.

Natural History Of Disease

- ❖ It signifies the way in which a disease **evolves** over time
- ❖ from the **earliest** stage of its **pre pathogenesis** phase to its **termination** as **recovery**, **disability** or **death**, in the absence of treatment or prevention.
- ❑ **Each disease** has its own **unique natural** history, which is **not** necessarily **the same in all individuals**,



What the physician sees in the hospital is just an "episode" in the natural history of disease.

The epidemiologist, by studying the natural history of disease in the community setting, is in a unique position to fill the gaps in our knowledge about the natural history of disease.

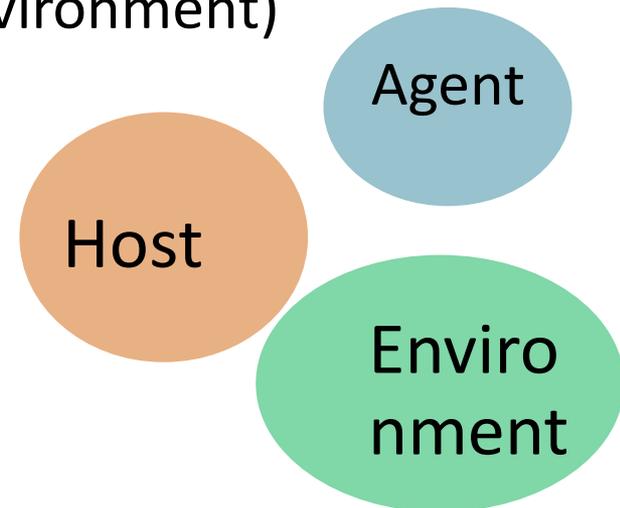
❑ Natural History of Disease Consisting of Two Phases:

- I. Prepathogenesis (i.e., the process in the environment)
- II. Pathogenesis (i.e., the process in man).

I. Pre pathogenesis

❖ This refers to the period preliminary to the onset of disease in man.

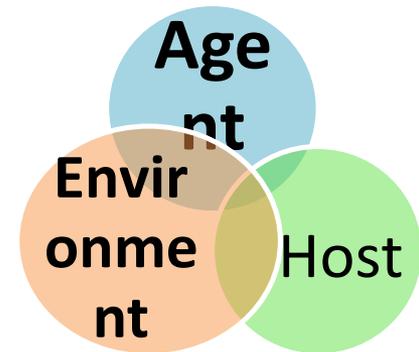
- The disease agent has not yet entered man,
- but the factors which favour its interaction
- with the human host are already existing in the environment.



- This situation is frequently referred to as "**man in the midst of disease**" or "**man exposed to the risk of disease**".
- Potentially we are all in the pre pathogenesis phase of many diseases, **both communicable** and **non-communicable**.
- The **causative factors** of disease may be
- classified as AGENT, HOST and ENVIRONMENT.
- These three factors are referred to as epidemiological triad

Pathogenesis Phase of Disease:

- ❖ The mere presence of **agent, host** and favourable **environmental** factors in the **prepathogenesis** period **is not sufficient** to start the disease in man.
- ❖ What is required is **an interaction** of these three factors to initiate the disease process in man

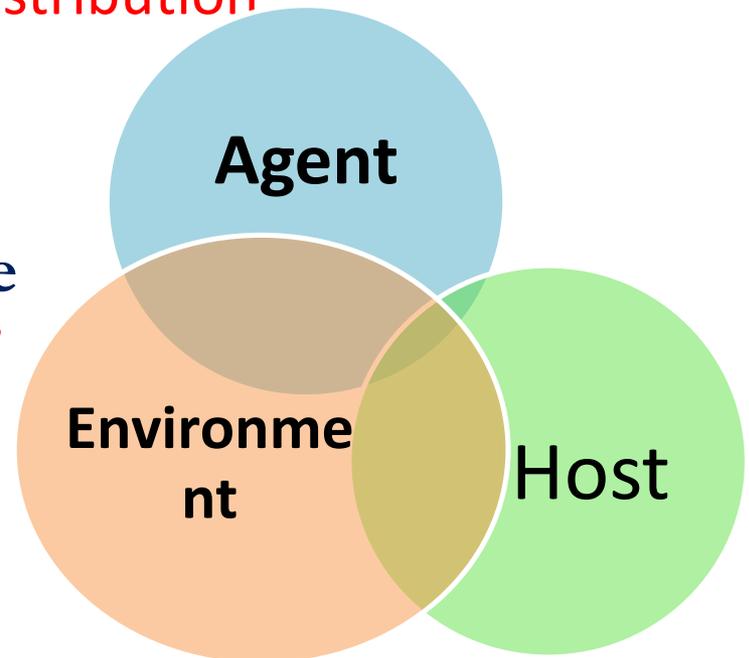


- ❖ Begins with **'Entry** of organism' in susceptible host
- **Multiplication** of organism, disease initiation and progression
- Host may become a **clinical** case, **subclinical** case or **carrier**
- Final outcome may be **recovery**, **disability** or **death**

□ The agent, host and environment operating in combination

- ❖ **determine not only the onset** of disease which may range from a single case to **epidemics** but **also** the **distribution** of disease in the community.

The objective of preventive medicine is to intercept or oppose the "cause" and thereby the disease process.



CONCEPTS OF PREVENTION

The goals of preventive medicine are :

- ✓ to promote health,
- ✓ to preserve health,
- ✓ to restore health when it is impaired, and
- ✓ to minimize suffering and distress.

❖ Successful prevention depends upon

- ❖ knowledge of causation,
- ✓ dynamics of transmission,
- ✓ identification of risk factors and risk groups,
- ✓ availability of prophylactic or
- ✓ Early detection and treatment measures,
- ✓ An organization for applying these measures (**intervention**) to appropriate persons or groups, and
- ✓ continuous evaluation of and development of procedures applied (**intervention**) .

MODES OF INTERVENTION

"**Intervention**" can be defined as

any attempt **to intervene or interrupt** the usual sequence in the development of disease in man.

This may be by the provision of

- ✓ Treatment,
- ✓ Education, help or
- ✓ Social support.

Five modes of intervention have been described which form a continuum corresponding to the natural history of any disease.

they are:

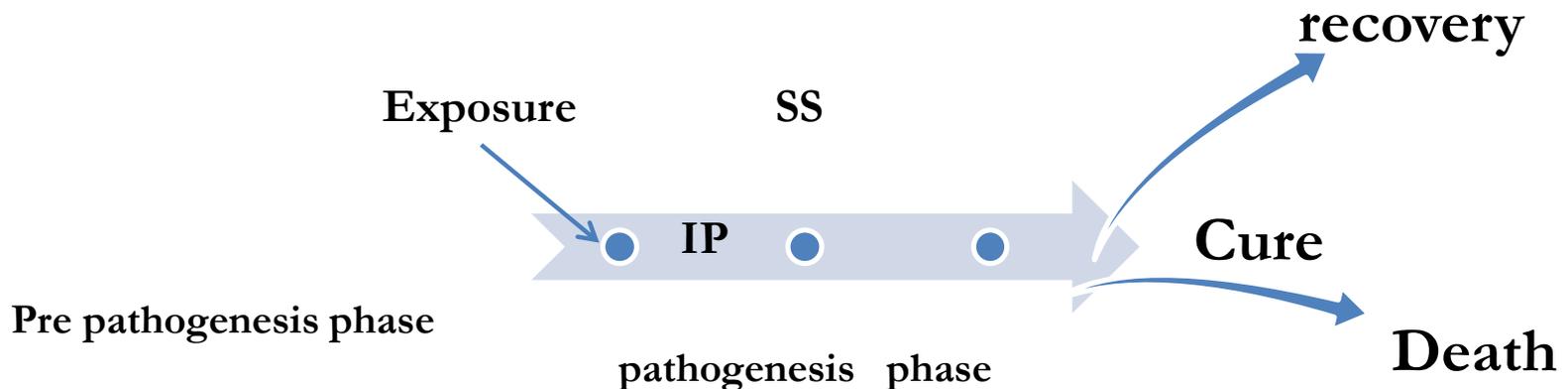
1. Health promotion
2. Specific protection
3. Early diagnosis and treatment
4. Disability limitation
5. Rehabilitation

Levels of prevention

In modern day, the concept of prevention has become broad-based. **in terms of four level:**

1. primordial prevention
2. primary prevention
3. secondary prevention
4. tertiary prevention

These levels of prevention are **in relation to the natural history of disease**



1. Primordial prevention

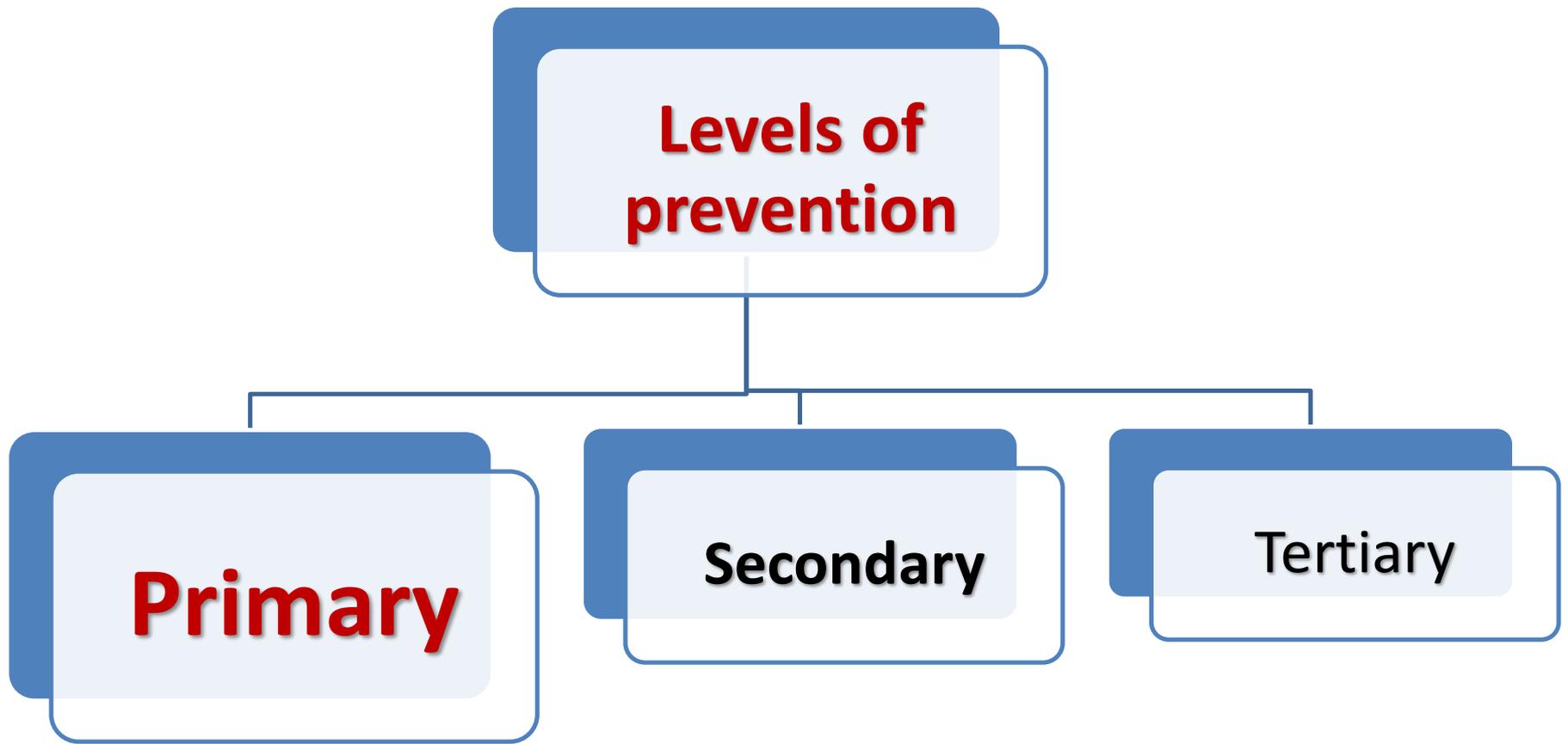
Primordial prevention, a **new concept**, is receiving special attention in the prevention of **chronic diseases**.

This is **primary prevention** in its purest sense,

- that is, **prevention of the emergence** or **development of risk factors** in **countries or population groups** in which they **have not yet appeared**.

For example, many adult health problems (e.g., obesity, hypertension) **have their early origins in childhood, because this is the time when lifestyles are formed** (*for example, smoking, eating patterns, physical exercise*).

- ❖ In primordial prevention, efforts are **directed towards**
- ❖ **discouraging children from adopting harmful lifestyles.**
 - ❖ The **main intervention** in **primordial prevention** is through
- ❖ **individual and mass education.**



There is no precise boundaries between these levels, but that does not minimize their importance.

For example, *the supply of food supplements to a family could be primary prevention for some members, and secondary prevention (curative) for others.*

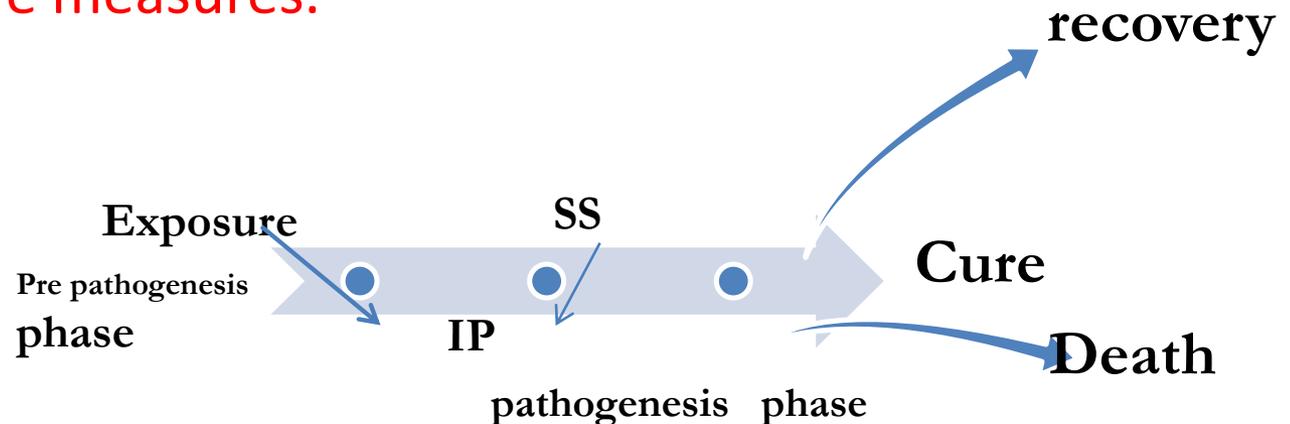


2. Primary prevention

Primary prevention can be defined as

"action taken prior to the onset of disease, which removes the possibility that a disease will ever occur".

- It signifies **intervention** in the **pre-pathogenesis** phase of a disease or health problem or other departure from health.
- ☐ Primary prevention may be accomplished by measures **designed to**
 - ❖ **promote general health** and well-being, and quality of life of people or by
 - ❖ **specific protective measures.**



1. Health promotion

- Health promotion is "the process of enabling people to increase control over, and to improve health" .
- ❖ It is **not** directed against any particular disease, but is
- ❖ intended to **strengthen** the **host** through a variety of approaches (interventions).

The **well-known interventions in this** area are:

- i. Health Education
- ii. Environmental Modifications
- iii. Nutritional Interventions
- iv. Lifestyle and Behavioural Changes

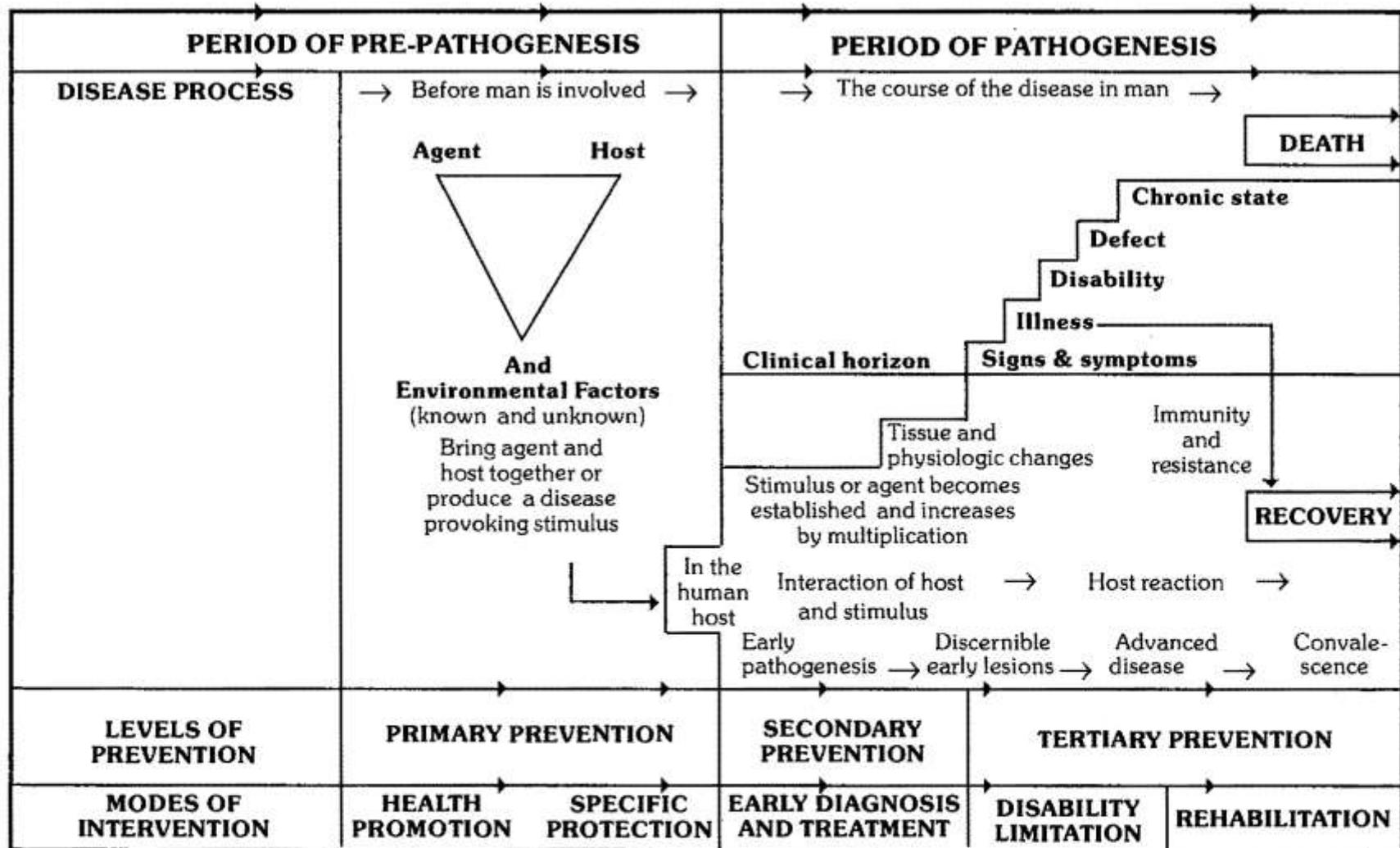


FIG. 8

Natural history of disease

(From Preventive Medicine for the Doctor in His Community, by Leavell & Clark with permission of McGraw-Hill Book Co.)

i) **i) Health education:**

- This is one of the **most cost effective** interventions.
- A large number of diseases could be prevented with little or no medical intervention
 - ✓ if people were adequately **informed about them** and if they
 - ✓ were encouraged to take **necessary precautions** in time.

Health promotion

health education

environmental modifications

nutritional interventions

lifestyle and behavioural change

The targets for educational efforts may include the

- General Public,
- Patients,
- Priority Groups,
- Health Providers,
- Community Leaders and
- Decision-makers.

(ii) Lifestyle and behavioural changes:

The action of prevention in this case,

is one of **individual** and **community** responsibility for health.

the **physician and each health worker** acting as an **educator** than a **therapist**.

iii) Environmental modifications:

A comprehensive approach to health promotion requires **environmental modifications**, such as provision of safe water; installation of sanitary latrines; control of insects and rodents; improvement of housing, etc.

*The history of medicine has shown that many infectious diseases have been successfully controlled in western countries **through environmental modifications**, even prior to the development of specific vaccines or chemotherapeutic drugs.*

(iv) Nutritional interventions: These comprise

- **food distribution** and
- Nutrition **improvement** of vulnerable groups;
- child feeding programmes;
- Food fortification;
- Nutrition education, etc.

2. Specific protection

- To avoid disease altogether is the ideal
- but this is possible only in a limited number of cases.
- The following are some of the currently available interventions aimed **at specific protection**:
 - (a) immunization
 - (b) use of specific nutrients
 - (c) Chemoprophylaxis
 - (d) protection against occupational hazards
 - (e) protection against accidents
 - (f) protection from carcinogens
 - (g) avoidance of allergens
 - (h) the control of **specific hazards** in the general environment, *e.g., air pollution, noise control*
 - (i) quality and **safety of foods**,

3. Secondary prevention

Secondary prevention can be defined as

"action which **halts** the **progress** of a disease at its incipient stage and **prevents complications**".

It include actions which **hinders** the **progress** of a disease at the **early stage** and **prevent complications**

The specific interventions are

- ❖ **Early diagnosis** {e.g. screening tests, case finding programmes) and
- ❖ **Adequate treatment** before irreversible pathological changes have taken place
- ❖ By early diagnosis and adequate treatment,
- ❖ **secondary prevention attempts** to
 - ✓ Arrest the disease process;
 - ✓ Treating it before irreversible pathological changes have taken place;
 - ✓ Restore health by **seeking out unrecognized disease** and
 - ✓ **Reverse communicability of infectious** diseases

- ❖ It may also **Protect others** in the community from acquiring the infection
- ❖ thus provide, at once, **secondary prevention** for the infected
- ❖ individuals and **primary prevention** for their potential contacts.

☐ Secondary prevention is largely the domain of clinical medicine

☐ **Early diagnosis and treatment**

WHO Expert Committee **defined early detection** as

"the detection of disturbances of mechanism while biochemical, morphological, and functional changes are still reversible."

Thus, in **order to prevent overt disease** or disablement,

➤ **The criteria of diagnosis should, if possible, be based on early**

➤ **biochemical,**

➤ **morphological and**

➤ **functional changes**

that precede the occurrence of
manifest signs and symptoms.

This is of particular importance in chronic diseases.

☐ **Early detection and treatment are the main interventions of disease control. SCREENING**

- ❖ The earlier a disease is diagnosed and treated
- the better it is from the point of view of prognosis and
- preventing the occurrence of further cases (secondary cases) or any long-term disability.
- Early effective therapy has made it possible
- to shorten considerably the period of communicability
- and reduce the mortality from acute communicable diseases
- ❖ Early diagnosis and treatment though not as effective and economical as "primary prevention"
- may be critically important in reducing the high morbidity and mortality in certain diseases such as *essential hypertension, cancer cervix and breast cancer.*

❑ The drawback of secondary prevention :

- ❖ the patient has already been subject to **mental distress**, **physical pain**; and the **community to loss of productivity**.
- ❖ These situations are not happen in primary prevention.
- ❖ Secondary prevention **is an imperfect** tool in the control of transmission of disease.
- ❖ It is often more expensive and
- ❖ less effective than primary prevention. .



4. Tertiary prevention

Disability limitation

- ❖ When a patient reports late in the pathogenesis phase,
- ❖ the mode of intervention is disability limitation.
- The objective of this intervention is to prevent or halt the transition of the disease process from impairment to handicap

When the disease process has advanced beyond its early stages, it is still possible to accomplish prevention by what might be called "tertiary prevention" It signifies intervention in the late pathogenesis phase.

Tertiary prevention can be defined as

"all measures available to reduce or limit impairments and disabilities, minimize suffering caused by this health problem *may prevent and limit disability.*

□ The aim of tertiary prevention is:

- To limit impairment and disability.
- To decrease suffering .
- To promote the patient adjustment to rehabilitation

5. Rehabilitation

defined as "the combined and coordinated use of medical, social, educational and vocational measures for training and retraining the individual to the highest possible level of functional ability"

It includes all measures aimed at reducing the impact of disabling and handicapping conditions and at enabling the disabled and handicapped to achieve social integration

- (a) Medical rehabilitation - restoration of function.
- (b) Vocational rehabilitation, restoration of the capacity to earn a livelihood.
- (c) Social rehabilitation - restoration of family and social relationships.
- (d) Psychological rehabilitation restoration of personal dignity and confidence.

Concept of disability

The sequence of events leading to disability and handicap have been stated as follows : **Disease ~ impairment ~ disability ~ handicap**

The WHO has defined these terms as follows:

(i) Impairment : "any **loss or abnormality** of psychological, physiological or anatomical structure or function", *e.g., loss of foot, defective vision or mental retardation.*

An impairment may be **visible or invisible, temporary or permanent, progressive or regressive.**

(ii) Disability :

Because of an impairment, the affected person may be **unable to carry out certain activities** considered normal for his age, sex, etc. This inability to carry out certain activities is termed "**disability**".

A disability has been defined as

"any **restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being**

(iii) Handicap :

This is termed "handicap", and is **defined as** “ a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfilment of a role that is normal (depending on age, sex, and social and cultural factors) for that individual". Taking accidents as an example, the

Examples of rehabilitations:

- **Special schools for blind pupils.**
- **Provision of aids for crippled.**
- **Reconstruction surgery for leprotics.**
- **Modification of life of cardiac patients**

DISEASE PREVENTION AND CONTROL

Every disease has certain **weak points** susceptible to attack.

- ✓ The basic approach in controlling disease is
- ✓ **to identify these weak points** and break the weakest links in the chain of transmission
- ✓ This requires sound **epidemiological**
- ✓ **knowledge of the disease** - that is its
 - **magnitude,**
 - **distribution in time,**
 - **place and person,**
 - **multifactorial causation,**
 - **sources of infection and**
 - **dynamics of transmission.**
- ❖ Frequently it may be necessary to **institute more than one method of control simultaneously.**

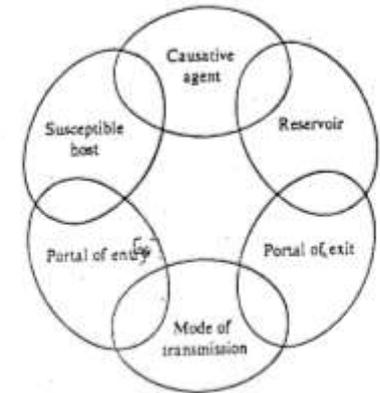


FIGURE 1.2 The chain of infection. Components of the infectious disease process.

General principles of prevention and control of communicable diseases

