



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Epidemiology

L VI

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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 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

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**.)³

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

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.,

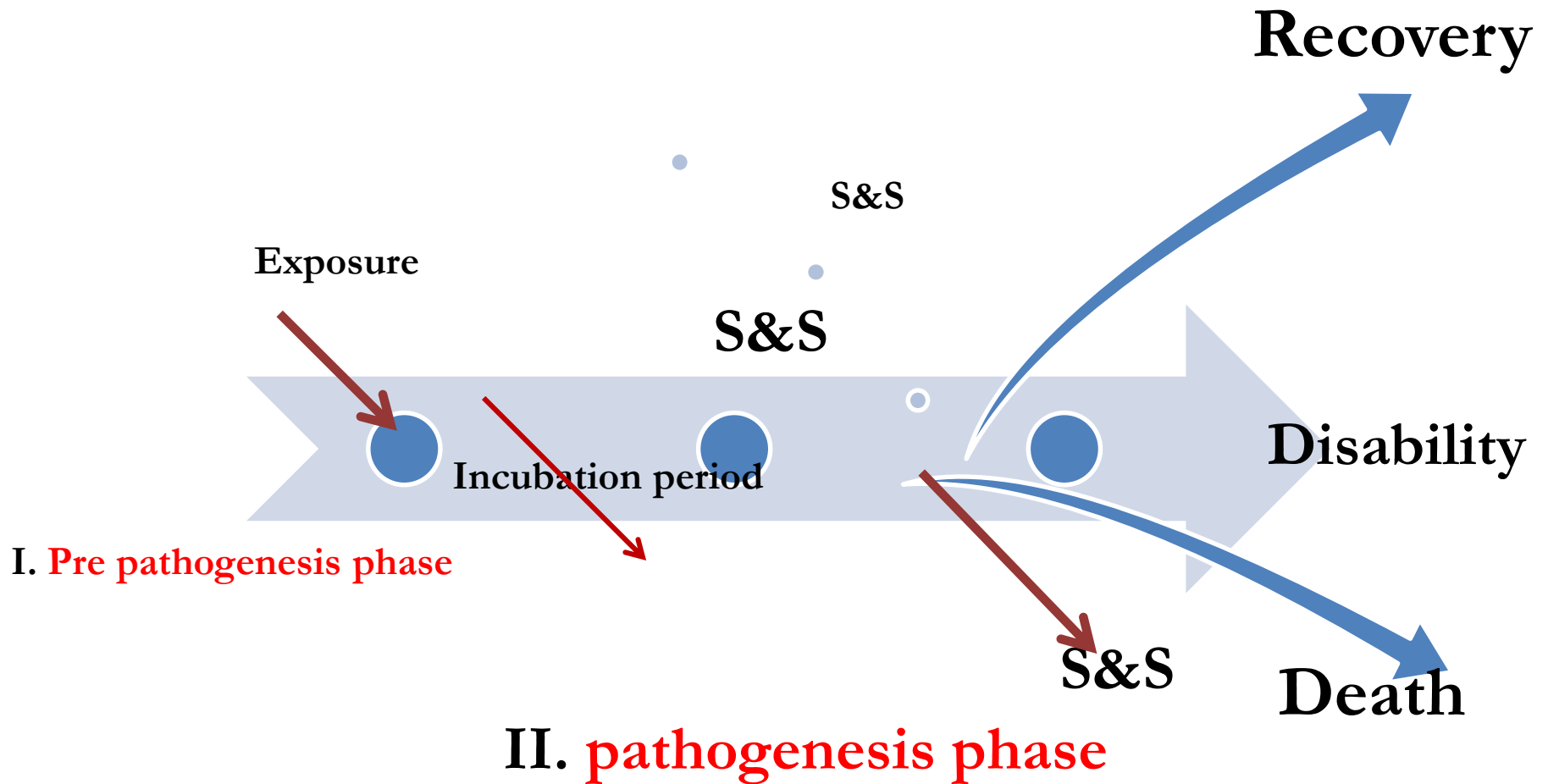
- ❖ Disease results from a **complex interaction** between **man**, an **agent** and the **environment**.

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**,



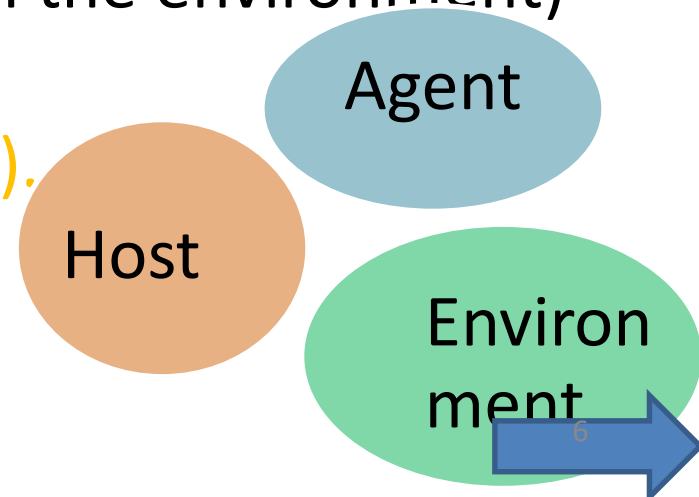
What the physician sees in the hospital is just an **"episode"** in the natural history of disease.

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.

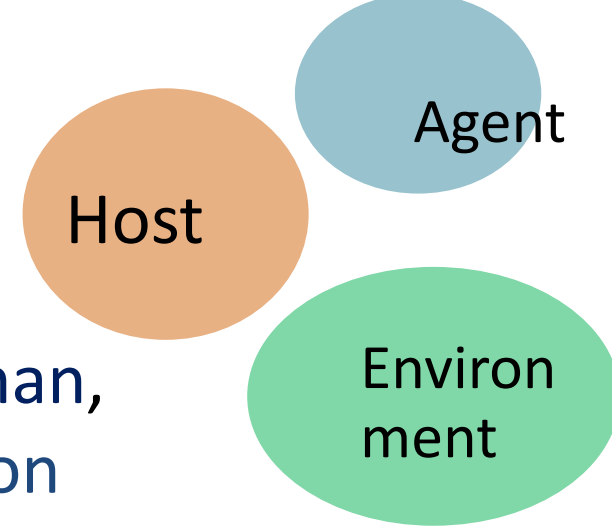
❑ **Natural History** of Disease Consisting of **Two Phases**:

I. **Pre-pathogenesis** (i.e. the process in the environment)

II. **Pathogenesis** (i.e. the process in man).



I. Pre pathogenesis

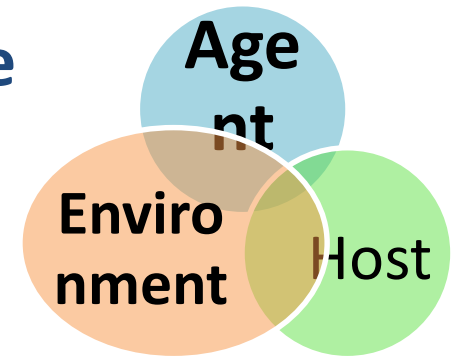


- ❖ This refers to the period preliminary to the onset of disease in man.
- The disease agent **has not yet entered** man,
- but the factors which favour its interaction
- with the human host are already existing in the environment.
- This situation is frequently referred to as "**man in the midst of 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**

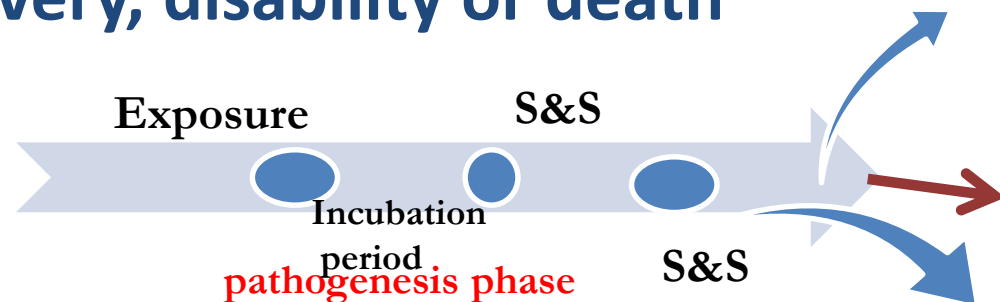
II Pathogenesis Phase of Disease:

- ❖ The mere presence of **agent**, **host** and favourable **environmental** factors in the **pre-pathogenesis** 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

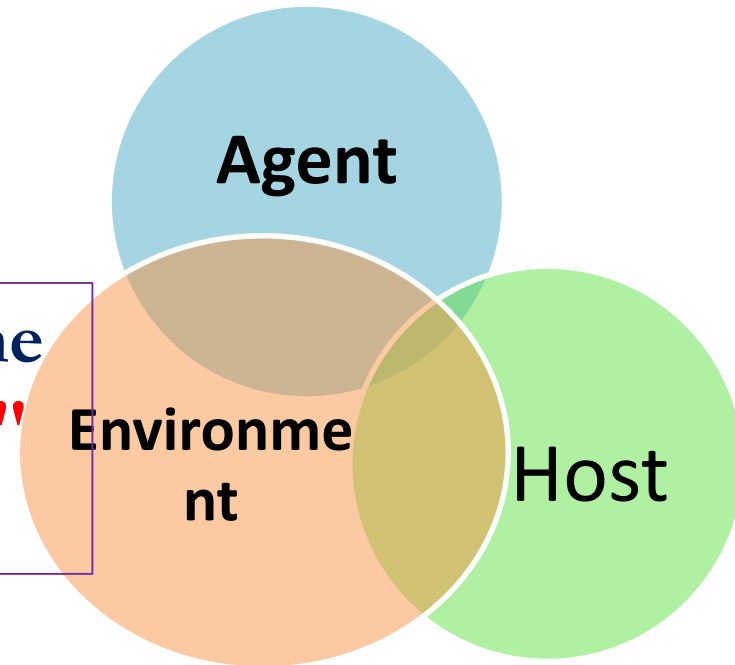


- ❖ Begins with '**Entry** of organism' in susceptible host
- **Multiplication** of organism, disease **initiation** and **progression**
- Host may become a **clinical** case, **subclinical** case or **carrier**
- Final outcome may be **recovery**, **disability** or **death**



- ❑ 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:

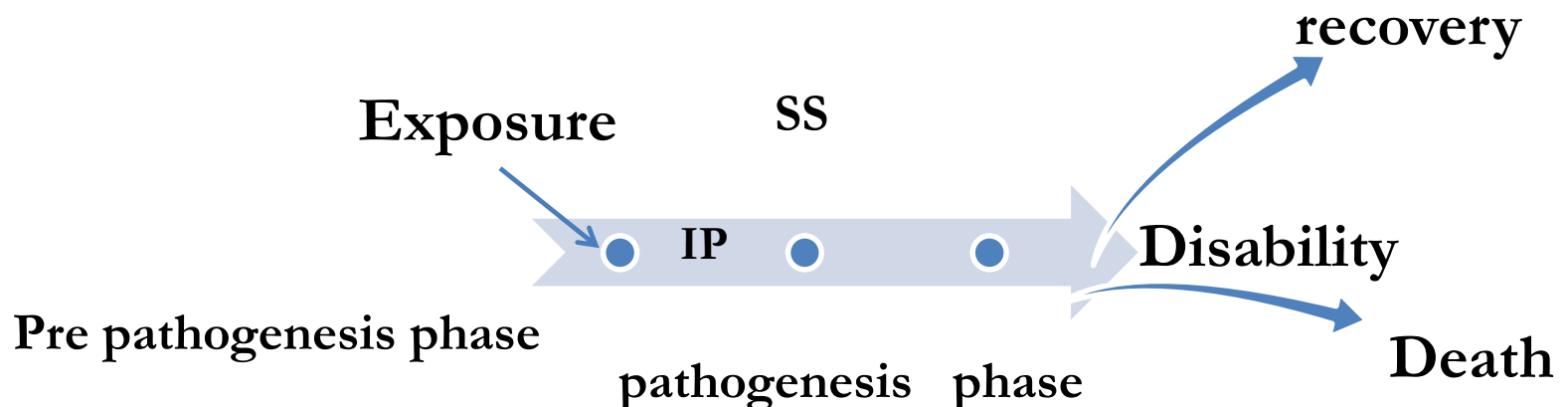
1. Health promotion
2. Specific protection
3. Early diagnosis and treatment
4. Disability limitation
5. Rehabilitation

❑ 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**



I. Primordial prevention

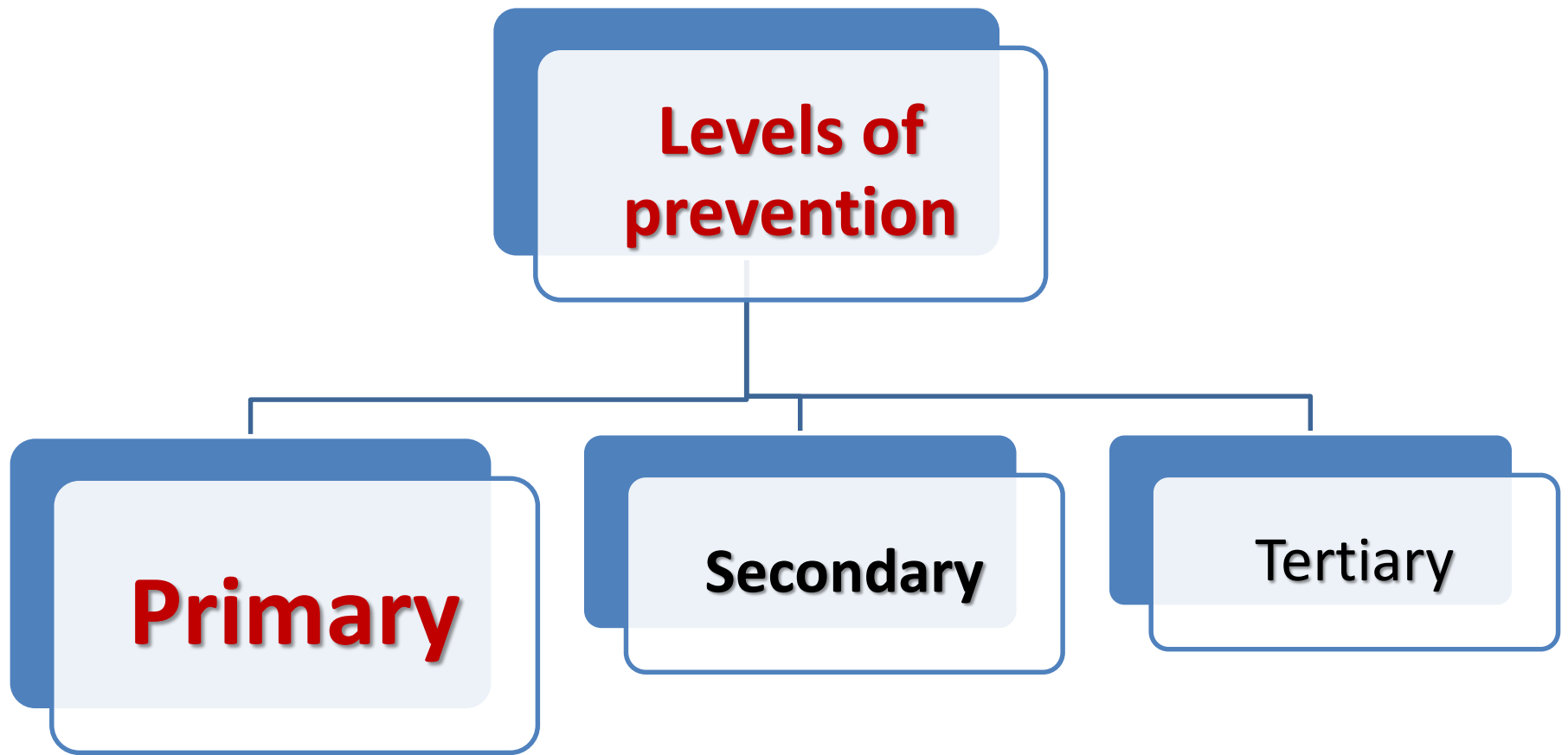
Primordial prevention, a **new concept**, is receiving special attention in the prevention of **chronic diseases**.

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 (*e.g., 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.*



II. Primary prevention

Primary prevention can be defined as

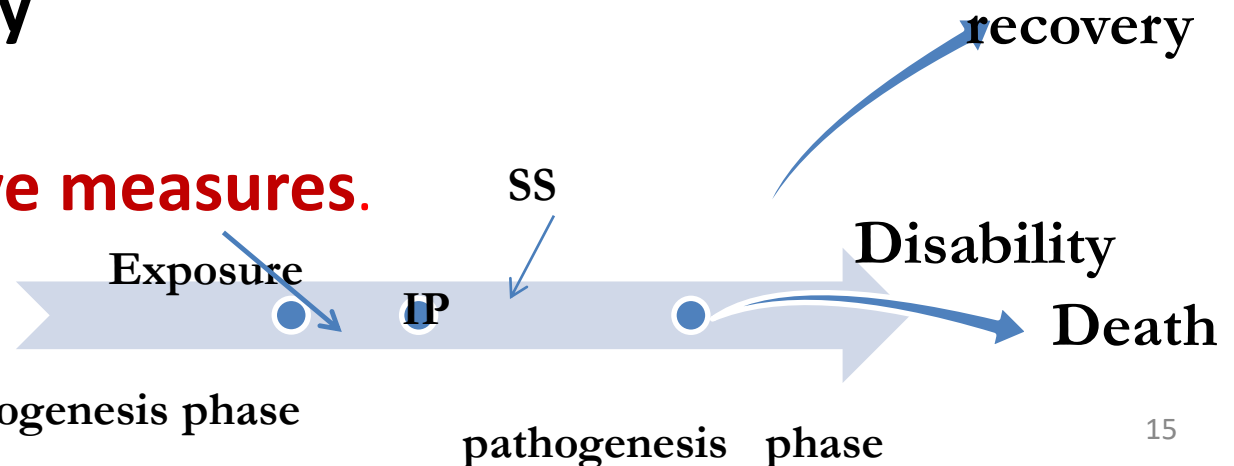
"Action taken **prior to the onset of disease**, which removes the possibility that a disease **will ever occur**".

➤ 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
- li. Environmental Modifications
- lii. Nutritional Interventions
- Iv. Lifestyle and Behavioural Changes

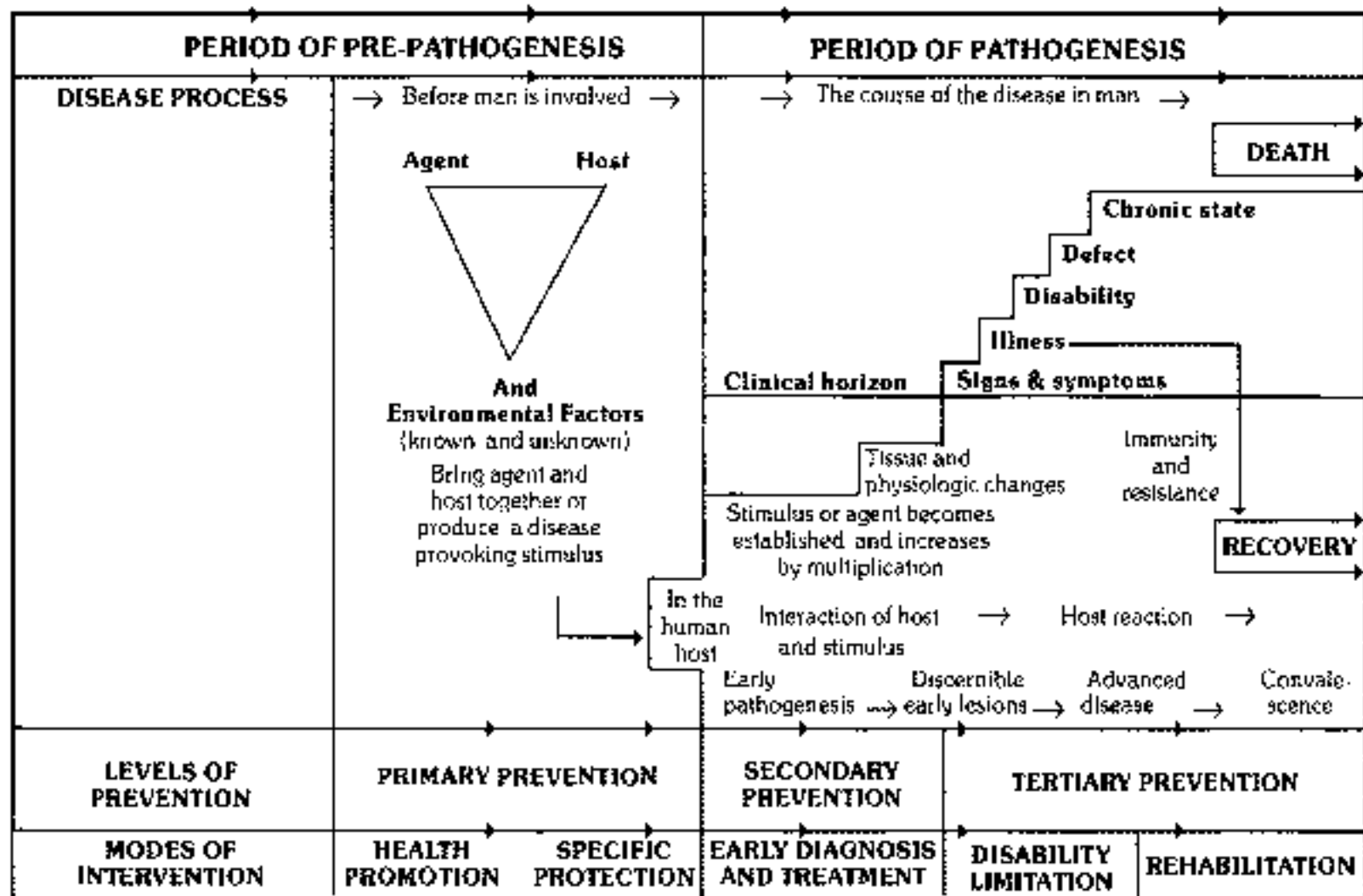


FIG. 8

Natural history of disease

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

(i)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.

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.
- ❑ 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) control of specific hazards in the general environment,
e.g., air pollution, noise control
 - (i) quality and safety of foods,

III. Secondary Prevention: 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 **diagnosed** the **better treated**
 - the **better 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.

IV -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

□ 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**

It includes all measures

- (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”.

Examples of rehabilitations:

- | | |
|---|---|
| <ul style="list-style-type: none">• Special schools for blind pupils.• Provision of aids for crippled. | <ul style="list-style-type: none">• Reconstruction surgery• Modification of life of cardiac patients |
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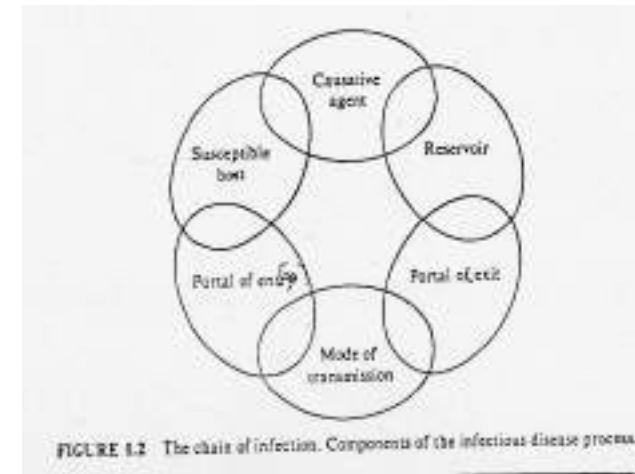


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DISEASE PREVENTION AND CONTROL

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**.



General principles of prevention and control of communicable diseases

