- **Pathophysiology**
- **Department of Pharmacy**
- **3rd stage**

Introduction to Pathophysiology

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Introduction to Pathophysiology

- Objectives
- In this session we will focus on;
- Define pathology and Pathophysiology
- Discuss the basic concepts of disease and its development.
- Briefly discuss each of the five components of the disease process which include; Prevalence, etiology, pathogenesis, clinical manifestation, and outcomes

Pathology

- The word pathology is from Greek, pathos, which means “feeling, or suffering”; and logia means the study of”
- Pathology is a branch of medical science primarily concerning the cause, origin, and nature of the disease.
- Body tissue, blood, and other body fluids are analyzed to assist medical practitioners in identifying the cause and severity of disease and to monitor treatment.

Clinical pathology

- Is a medical branch that is concerned with the diagnosis of disease based on the laboratory analysis of body fluids such as blood and urine, as well as tissues, using the tools of biochemistry, clinical microbiology, hematology, immunology, and molecular pathology e.g. PCR (polymerase chain reaction).

Pathophysiology

- *The pathophysiology* may be defined as the physiology of altered health. The term combines the words *pathology* and *physiology*.

- Basically, Pathophysiology is the disordered physiological processes associated with injury or disease (the immune system).
- This area study how the body reacts to injury or fights off disease.
- The functional changes associated with or resulting from disease or injury ex,. inflammation in response to an injury.

Disease

- The term disease means “without ease” (uneasiness), when something is wrong with body function.

- The term disease broadly refers to any condition that impairs the normal functioning of the body.

- Diseases are associated with the dysfunctioning of the body’s normal homeostatic processes.

Pathogenesis

- The word Pathogenesis comes from the Greek pathos (disease) and genesis (creation).

- The Pathogenesis of the disease is the biological mechanism that leads to the disease state. The term can also describe the origin and development of the disease and whether it is acute, chronic, or recurrent.

Factors affecting the pathogen

1- Mechanism of action: pathogens directly damage cells, interfere with cellular metabolism, and render the cell dysfunctional. Because of the accumulation of pathogenic substances and toxic production.

2- Infectivity: the ability of the pathogen to invade and multiply in the host.

3- Pathogenicity: the ability of an agent to produce disease depend on its speed of production, the extent of tissue damage, and the production of toxin.

4- Virulence: the potency of a pathogen measured in terms of the number of microorganisms of toxin required to kill the host.

Factors affecting the pathogen

5- Immunogenicity: the ability of pathogens to induce an immune response.
6- Toxigenicity: a factor important in determining a pathogen's virulence, such as hemolysin, leucosidine, and other exotoxins, and endotoxins. Hemolysin destroy erythrocyte, and leucocidin destroys leucocytes, both are the product of streptococci and staphylococci.
7- Portal of entry: the route by which a pathogenic organism infects the host: direct contact, inhalation, ingestion, or bite of an animal or insect. The spread of infection is facilitated by the ability of pathogens to spread through the lymph and blood into tissue and organ, where they multiply and cause disease

Natural History of the Disease

- The natural history of disease is the course a disease takes place in an individual from its pathological onset to its eventual resolution through complete recovery, disability, or death in the absence of intervention.
- It has four stages

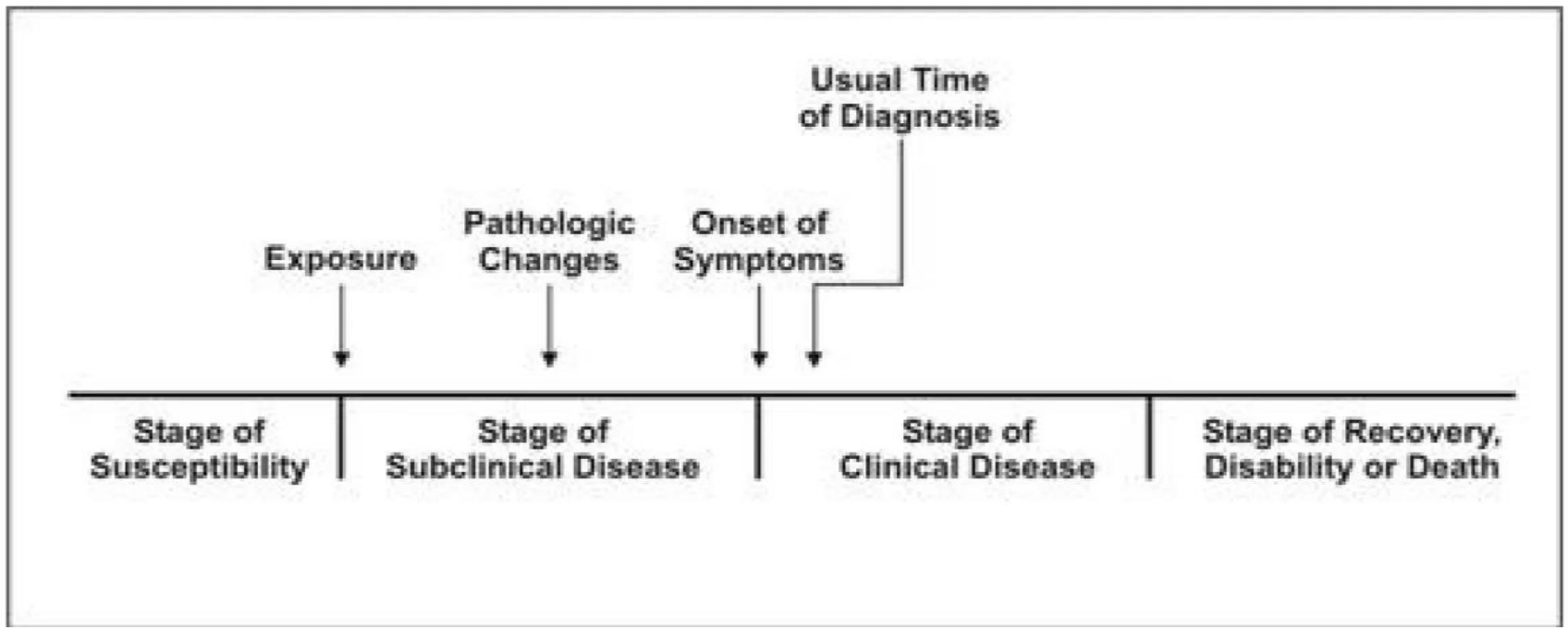
1- stage of susceptibility.

2- stage of subclinical disease.

3- stage of clinical disease.

4- stage of recovery, or disability or death.

Natural History of Disease



Prevalence

- In a statistical population is defined as the total number of cases of the risk factor in the population at a given time or the total number of cases in the population, divided by the number of individuals in the population.
- Prevalence $= \mathrm{a}/\mathrm{a} + b$

Etiology

- Etiology is the study of causation or origination
- The word is derived from the Greek, aitiologia,

"giving a reason for" Used in medical and philosophical theories, where it is used to refer to the study of why things occur or even the reasons behind the way that things act.

The causes of disease are known as *etiologic factors*.

- Among the recognized etiologic agents are biological agents (e.g., bacteria, viruses), physical forces (e.g., trauma, burns, radiation), chemical agents (e.g., poisons, alcohol), and nutritional excesses or deficits.

Etiology

- At the molecular level, it is important to distinguish between abnormal molecules and molecules that cause disease.

- This is true of diseases such as cystic fibrosis, sickle cell anemia, and familial hypercholesterolemia, in which the genetic abnormality of single amino acid, transporter molecule, or receptor protein produces widespread effects on health.

Clinical manifestation

- Diseases can manifest in a number of ways.
- Sometimes the condition produces manifestations, such as fever, that make it evident that the person is sick.
- In other cases, the condition is silent at the onset and is detected during examination for other purposes or after the disease is far advanced.
- *Signs* and *symptoms* are terms used to describe the structural and functional changes that accompany a disease.
- A *symptom* is a subjective complaint that is noted by the person with a disorder, whereas a *sign* is a manifestation that is noted by an observer.

Signs and *symptoms*

- Pain, difficulty in breathing, and dizziness are symptoms of a disease.
- An elevated temperature, a swollen extremity, and changes in pupil size are objective signs that can be observed by someone other than the person with the disease.
- Signs and symptoms may be related to the primary disorder or they may represent the body's attempt to compensate for the altered function caused by the pathologic condition.

- Many pathologic states are not observed directly—one cannot see a sick heart or a failing kidney. Instead, what can be observed is the body's attempt to compensate for changes in function brought about by the disease, such as the tachycardia that accompanies blood loss or the increased respiratory rate that occurs with pneumonia.
- A ***syndrome*** is a compilation of signs and symptoms (e.g., chronic fatigue syndrome) that are characteristic of a specific disease state.
- **Complications** are possible adverse extensions of a disease or outcomes from treatment.
- ***Sequelae*** are lesions or impairments that follow or are caused by a disease.

Outcome

The consequence of the disease or the end of the disease is known as the outcome which may be any of the following forms

- Complete recovery
- Recovery with disability
- Death

Morphology

- ***Morphology*** refers to the fundamental structure or form of cells or tissues.
- *Morphologic changes* are concerned with both the gross anatomic and microscopic changes that are characteristic of a disease.
- ***Histology*** deals with the study of the cells and extracellular matrix of body tissues. The most common method used in the study of tissues is the preparation of histologic sections—thin, translucent sections of human tissues and organs—that can be examined with the aid of a microscope.
- Histologic sections play an important role in the diagnosis of many types of cancer.
- A ***lesion*** represents a pathologic or traumatic discontinuity of a body organ or tissue.
- Descriptions of lesion size and characteristics often can be obtained through the use of radiographs, ultrasonography, and other imaging methods.
- Lesions also may be sampled by biopsy and the tissue samples subjected to histologic study.

Diagnosis

- A *diagnosis* is a designation as to the nature or cause of a health problem (e.g., bacterial pneumonia or hemorrhagic stroke). The diagnostic process usually requires a careful history and physical examination. The history is used to obtain a person's account of his or her symptoms and their progression, and the factors that contribute to a diagnosis.
- The physical examination is done to observe for signs of altered body structure or function.
- The development of a diagnosis involves weighing competing possibilities and selecting the most likely one from among the conditions that might be responsible for the person's clinical presentation.

Diagnosis

- The clinical probability of a given disease in a person of a given age, gender, race, lifestyle, and locality often is influential in arriving at a presumptive diagnosis. Laboratory tests, radiologic studies, computed tomography (CT) scans, and other
- tests often are used to confirm a diagnosis. An important factor when interpreting diagnostic test results is the determination of whether they are normal or abnormal.