Al-Zahrawi University **1st Semester**

Pathophysiology **3rd Grade**

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(Introduction to Pathophysiology)

What is Pathophysiology?

Definition: Study of changes in body function that result from disease or injury.

The word comes from relationship between disease (**pathology**) and normal body function (**physiology**).

Pathophysiology is like a cross **bridge** between pathology and physiology.

Why studing pathophysiology is important to pharmacists?

Pharmacists are **healthcare professionals** who need to understand diseases to provide safe, effective therapy. Pathophysiology is also related to **Toxicology** (study the actions and effects of poisons and **overdose drugs**).

Link between disease and drug:

- **Pathophysiology** explains how **diseases** develop.

- **Pharmacology** explains how **drugs** work.

Together, they help pharmacists choose the right drug for the right patient.

Example:

In **hypertension**, **Pathophysiology** explains how **hypertension** happened. While **Pharmacology** explains how **antihypertensive drugs** acts to **reduce** blood pressure.

In general, studying Pathophysiology help in:

- Understand why signs & symptoms happen.

- Guides diagnosis & treatment.

- Makes us better at predicting complications.

Terminology

How to understand any disease in Pathophysiology:

Ask these 5 questions:

1 - What causes it? (Etiology)

2 - How does it develop? (Pathogenesis)

3 - How do we confirm it? (Diagnosis)

4 - What does it look like? (Signs & Symptoms)

5 - What happens if untreated? (Complications)

Etiology (Cause of Disease)

Examples:

- Genetic or familial (e.g., cystic fibrosis)

- Acquired (infection, injury, lifestyle)

Pathogenesis (How disease develops)

The **step-by-step story** of how damage begins and spreads.

Example:

Overeating and fatty liver.

Eating more calories than the body needs (high-fat, high-sugar foods).

Extra calories are stored as triglycerides in fat cells.

Enlarged fat cell stored in the liver leading to fatty liver.

What is the difference between sign vs. symptom?

1 – Sign:

A feature observed or measured by the doctor, nurse, or lab test.

2 – Symptom:

A feature noticed or felt by the patient.

Examples

Signs (Objective)	Symptoms (Subjective)
Fever 🌡️ (measured)	Feeling hot or chills ❄️
High blood pressure 🩸	Headache 🤕
Skin rash 👀	Itching 😣
Rapid heartbeat (tachycardia) ❤️	Palpitations ("my heart is racing")
Lab result: high blood sugar	Fatigue, excessive thirst

What is diagnosis?

Is the investigation process led by the **clinician** by using tools such as patient history, lab tests, signs, symptoms, etc. Sometimes, it is like **solving a mystery**.

What is complication?

Is a **new medical condition** that develops during the course of **untreated disease (sometimes during treatment)**. It makes the original disease worse or creates additional health problems.

What is prognosis?

The **predicted outcome** or future course of a disease.

Example: It answers:

Will the patient recover?

How long will it take?

What are the chances of complications or death?

What is the difference between diagnosis and prognosis?

Diagnosis = What is the disease?

Prognosis = What will happen because of the disease?

Response to treatment is one of the factors affecting prognosis

Example:

Hypertension:

Case1: if hypertension is treated.

(controlled) → good prognosis if patient takes medication.

Case2: if hypertension is untreated.

(uncontrolled) → bad prognosis (complications) if patient does not takes medication.

What is Epidemiology?

Definition: Epidemiology is the science of **disease in populations** (**not individuals**).

Questions Epidemiology Answers

- Who? (age, sex, lifestyle, occupation)

- How? (mode of acquiring disease)

- When? (season, short-term outbreak vs long-term disease)

- Where? (country, city, rural vs. urban)

General example to illustrate

Diabetes Mellitus (DM) type2:

Etiology: Insulin deficiency or resistance.

Pathogenesis: Insulin deficiency led to high blood sugar → glucose in urine.

Signs: Elevated glucose in blood.

Symptoms: Frequent urination, dehydration, thirst, fatigue.

Diagnosis: After lab tests and other signs and symptoms (DM type2).

Complications: kidney failure, blindness, neuropathy, foot ulcers.

prognosis:

- If early lifestyle modification + medications → good long-term outcomes.

- If poorly controlled Type 2 DM → higher risk of complications.

Epidemiology:

- Over 500 million adults worldwide have DM.

- Increases with age, and affects both sexes almost equally.

- Highest prevalence in Middle East and North Africa (Arabic countries).

- High prevalence in people with obesity, lack of physical activity, and smoking.

Table 1.1 Terminology used in disease and its management

Term used		Description
Definition		Brief summary
Aetiology	*Why?*	Causes; risk factors
Epidemiology	*Who?*	In population as whole, and in specially susceptible groups
Incidence		Frequency of new cases
Prevalence		Number of sufferers at any time
Pathology	*How? What?*	Mechanisms of malfunction
Pathogenesis		Underlying disease process
Pathophysiology		Disorder of normal function
Clinical features (presentation)		
Symptoms		Features noticed by patient: Subjective ('complains of')
Signs		Features noted by clinician: Objective ('on examination')
Investigations		Most appropriate methods
Natural history (course)	*When?*	Onset, progression, duration, resolution Severity Complications Mortality
Management		
Aims		Symptomatic relief Slow or arrest disease Reverse disease (cure) Prevent disease
Duration		Acute, chronic Maintenance (continuation) Prophylaxis
Treatment modes		Medication Nursing care Surgery Occupational therapy Radiotherapy Physiotherapy Social support, etc.
Monitoring		Progress of disease Benefits of treatment Side-effects of treatment
Prognosis		Probable outcomes