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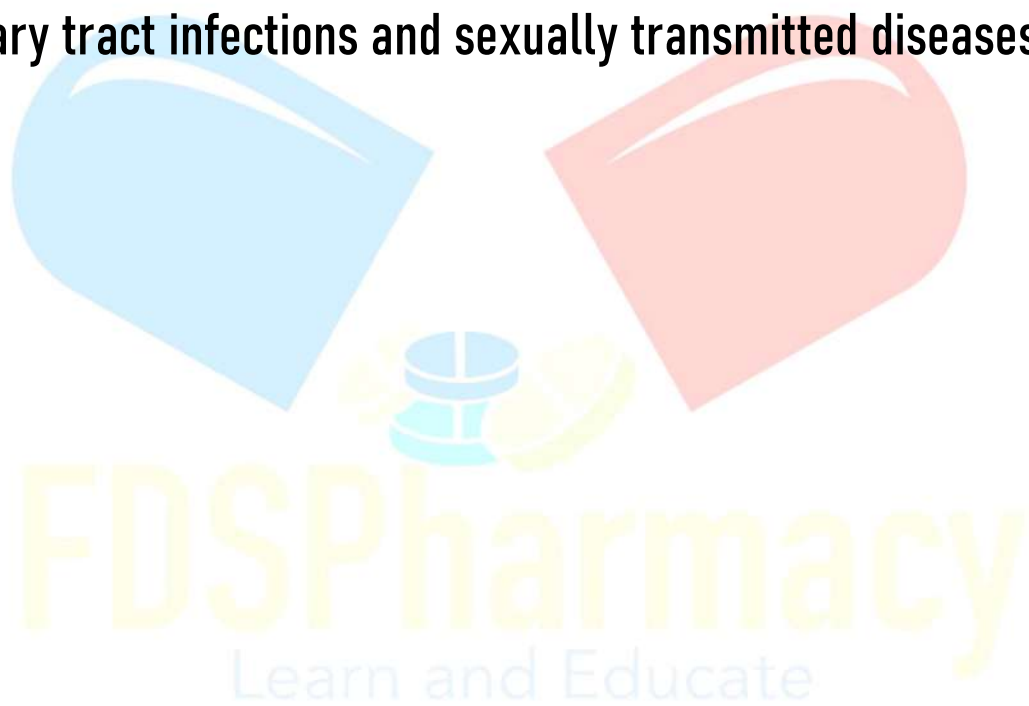
PHARMACOLOGY - III

UNIT 4

TOPIC :

- **Chemotherapy**

I. Urinary tract infections and sexually transmitted diseases.



Urinary Tract Infections (UTIs)

- Urinary Tract Infection (UTI) is a microbial infection affecting any part of the urinary system including the kidneys, ureters, urinary bladder, and urethra.
- It is commonly caused by bacteria, especially *Escherichia coli*, which enter the urinary tract and multiply, producing inflammation and infection.
- UTIs are among the most common infections encountered in clinical practice and are more frequent in females due to shorter urethra.
- The urinary tract is normally sterile except for the distal part of urethra. Several defense mechanisms such as:
 - Urine flow
 - Acidic urine
 - Bladder emptying
 - Immune response
- help prevent infection.
- When microorganisms overcome these defenses, infection develops.

Anatomy of Urinary Tract

The urinary tract consists of:

1. Kidneys

- Filter blood
- Produce urine

2. Ureters

- Carry urine from kidneys to bladder

3. Urinary Bladder

- Stores urine

4. Urethra

- Removes urine from body

Classification of UTIs

1. According to Site of Infection

A. Upper Urinary Tract Infection

Involves:

- Kidneys
- Ureters

Example

- Pyelonephritis

Features

- Fever
- Chills
- Flank pain
- Nausea

B. Lower Urinary Tract Infection

Involves:

- Bladder
- Urethra

Examples

- Cystitis
- Urethritis

Features

- Burning micturition
- Frequency
- Urgency

Pathophysiology of UTI

Ascending Infection

→ Most UTIs occur by ascending spread.

Steps:

1. Organisms enter urethra.
2. Reach urinary bladder.
3. Multiply in urine.
4. Cause inflammation.

5. May ascend to kidneys.

Drugs Used in UTIs

1. Urinary Antiseptics

A. Nitrofurantoin

→ Nitrofurantoin is a urinary antiseptic effective mainly in lower UTIs.

Mechanism of Action

- It damages bacterial DNA and bacterial enzymes.

Pharmacokinetics

- Well absorbed orally
- Rapid renal excretion
- Concentrated in urine

Uses

- Acute cystitis
- Recurrent UTI prophylaxis

Adverse Effects

- Nausea
- Peripheral neuropathy
- Pulmonary fibrosis (rare)

Advantages

- Effective against common urinary pathogens
- Low resistance

Disadvantages

- Ineffective in severe renal impairment
- Not useful for pyelonephritis

2. Sulfonamides

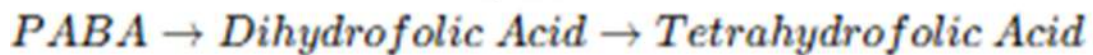
Cotrimoxazole

Combination of:

- Sulfamethoxazole
- Trimethoprim

Mechanism of Action

Sequential blockade of folic acid synthesis.



This inhibits bacterial DNA formation.

Uses

- UTIs
- Respiratory infections
- GI infections

Adverse Effects

- Skin rash
- Crystalluria
- Bone marrow suppression

3. Fluoroquinolones

Ciprofloxacin

→ Broad-spectrum fluoroquinolone antibiotic.

Mechanism of Action

Inhibits:

- DNA gyrase
- Topoisomerase IV



DNA Replication $\xrightarrow{\text{Inhibition of DNA Gyrase}}$ *Bacterial Cell Death*

Uses

- Complicated UTI
- Pyelonephritis
- Pseudomonas infections

Adverse Effects

- Tendon rupture
- GI disturbances
- CNS toxicity

Contraindications

- Pregnancy
- Children

4. Penicillins

Amoxicillin

Mechanism of Action

Inhibits bacterial cell wall synthesis.

Peptidoglycan Cross Linking → Inhibited Cell Wall Synthesis

Uses

- Mild UTIs
- Enterococcal infections

Adverse Effects

- Allergy
- Diarrhea

5. Cephalosporins

Examples

- Cefixime
- Ceftriaxone

Uses

- Complicated UTI
- Pyelonephritis

Advantages

- Broad-spectrum activity
- Better resistance profile

6. Aminoglycosides

Examples

- Gentamicin
- Amikacin

Mechanism of Action

- Inhibit protein synthesis by binding to 30S ribosome.

Uses

- Severe complicated UTIs
- Septicemia

Adverse Effects

- Nephrotoxicity
- Ototoxicity

7. Fosfomycin

→ Broad-spectrum antibiotic used as single-dose therapy.

Mechanism of Action

- Blocks bacterial cell wall synthesis.

Uses

- Acute uncomplicated cystitis

Advantages

- Single oral dose
- Good patient compliance

Sexually Transmitted Diseases (STDs) / Sexually Transmitted Infections (STIs)

- Sexually Transmitted Diseases (STDs) are infectious diseases that are mainly spread through sexual contact (vaginal, anal, or oral sex). They can also spread through infected blood transfusion, sharing contaminated needles, from mother to baby during pregnancy, childbirth, or breastfeeding.
- STDs are caused by bacteria, viruses, or parasites. If left untreated, some STDs can lead to infertility, cancer, organ damage, or even death.

Causes of STDs

STDs are caused by:

- Bacteria
- Viruses
- Parasites

Modes of Transmission

- Unprotected vaginal, anal, or oral sex
- Multiple sexual partners
- Sharing infected needles or syringes
- Blood transfusion with infected blood
- Mother-to-child transmission during pregnancy, delivery, or breastfeeding

Types of STDs

1. Bacterial STDs

(i) Chlamydia

Causative Organism:

Chlamydia trachomatis

Definition

→ Chlamydia is one of the most common bacterial sexually transmitted infections. It affects both males and females and mainly infects the reproductive organs. It may also infect the throat, rectum, and eyes.

Symptoms

- Often no symptoms (asymptomatic)
- Abnormal vaginal or penile discharge
- Burning sensation during urination
- Pain while urinating
- Lower abdominal or pelvic pain
- Pain during sexual intercourse

Complications

- Pelvic Inflammatory Disease (PID)
- Infertility
- Ectopic pregnancy
- Infection in newborn babies

Treatment

- Antibiotics (such as Azithromycin or Doxycycline)
- Sexual partner should also receive treatment.

(ii) Gonorrhea

Causative Organism:

Neisseria gonorrhoeae

Definition

→ Gonorrhea is a bacterial STD affecting both men and women. It mainly infects the genital tract but can also infect the throat, rectum, and eyes.

Symptoms

- Often asymptomatic
- Thick yellow or green discharge
- Painful urination
- Increased vaginal discharge
- Pelvic pain in women
- Pain or swelling in testicles (men)
- Bleeding between menstrual periods

Complications

- Infertility
- Pelvic inflammatory disease
- Epididymitis
- Infection of joints and blood

Treatment

- Antibiotics (Ceftriaxone-based therapy)

(iii) Syphilis

Causative Organism:

Treponema pallidum

→ Syphilis is a chronic bacterial STD that progresses through different stages if left untreated.

Stages and Symptoms

1. Primary Stage

- Painless sore (Chancre)
- Appears on genital organs, anus, or mouth
- Highly infectious

2. Secondary Stage

- Skin rash
- Fever
- Sore throat
- Swollen lymph nodes
- Mouth ulcers
- Hair loss

3. Latent Stage

- No visible symptoms
- Infection remains inside the body

4. Tertiary Stage

- Damage to heart
- Brain damage
- Nervous system disorders
- Blindness
- Paralysis
- Organ failure

Treatment

- Penicillin injection
- Early treatment prevents complications.

2. Viral STDs

→ Viral STDs usually remain lifelong because viruses cannot be completely eliminated, but medicines help control symptoms.

(i) HIV/AIDS

Causative Organism:

Human Immunodeficiency Virus (HIV)

Definition

→ HIV attacks the body's immune system, especially CD4 T-lymphocytes. If untreated, it progresses to AIDS (Acquired Immunodeficiency Syndrome).

Symptoms

- Fever
- Weight loss
- Night sweats
- Swollen lymph nodes
- Recurrent infections
- Fatigue

Complications

- Severe immune deficiency
- Opportunistic infections
- Certain cancers

Treatment

- Antiretroviral Therapy (ART)
- No complete cure but treatment controls the disease.

(ii) Herpes Simplex Virus (HSV)

Types

- **HSV-1:** Causes oral herpes (cold sores)
- **HSV-2:** Causes genital herpes

Symptoms

- Painful blisters
- Itching
- Burning sensation
- Fever
- Recurrent outbreaks

Complications

- Neonatal herpes
- Eye infection
- Increased risk of HIV infection

Treatment

- Antiviral drugs (Acyclovir, Valacyclovir)

(iii) Human Papillomavirus (HPV)

→ HPV is a group of viruses that mainly infect the skin and genital area.

Symptoms

- Genital warts
- Often asymptomatic

Complications

- Cervical cancer
- Penile cancer
- Anal cancer
- Throat cancer

Prevention

- HPV vaccine
- Regular cervical screening (Pap smear)

Treatment

- No cure for the virus
- Warts treated with medicines or surgery

3. Parasitic STDs

(i) Trichomoniasis

Causative Organism:

Trichomonas vaginalis

Definition

→ Trichomoniasis is a parasitic STD that commonly affects the vagina in women and the urethra in men.

Symptoms

Women

- Frothy yellow-green vaginal discharge
- Bad smell
- Vaginal itching
- Painful urination
- Pain during intercourse

Men

- Burning during urination
- Penile discharge
- Irritation inside the penis
- Many men have no symptoms

Complications

- Pregnancy complications
- Increased HIV risk

Treatment

- Metronidazole
- Tinidazole
- Sexual partner should also be treated.