

Q1. Define Antibiotics.

(a) **Definition of Antibiotics**

Antibiotics are chemical substances produced by microorganisms (or synthesized artificially) that inhibit the growth of or destroy bacteria without harming human cells. They are used to treat bacterial infections.

Example: Penicillin, Amoxicillin, Tetracycline.

Antibiotics do **not** work against viral infections like the common cold or flu.

(b) List the classification of sulphonamides.

:- Classification of Sulphonamides

Sulphonamides are classified based on their **duration of action** and **clinical use**:

1. Based on Duration of Action

1. **Short-acting** ($T_{1/2} < 12$ hours)
 - **Example:** Sulfisoxazole, Sulfamethoxazole
2. **Intermediate-acting** ($T_{1/2}$ 12-24 hours)
 - **Example:** Sulfadiazine
3. **Long-acting** ($T_{1/2} > 24$ hours)
 - **Example:** Sulfadoxine

2. Based on Clinical Use

1. **Systemic Sulphonamides** (Used for systemic infections)
 - **Example:** Sulfamethoxazole (combined with Trimethoprim as Cotrimoxazole)
2. **Topical Sulphonamides** (Used for burns, wounds, or eye infections)
 - **Example:** Silver Sulfadiazine, Sulfacetamide
3. **Intestinal Sulphonamides** (Used for GI infections)
 - **Example:** Sulfasalazine (for ulcerative colitis)

Sulphonamides work by **inhibiting bacterial folic acid synthesis**, making them effective **bacteriostatic agents**.

(c) write in detail pharmacological action and nurse's responsibility of sulphonamides group of drugs.

:- Pharmacological Action and Nurse's Responsibility of Sulphonamides

1. Pharmacological Action of Sulphonamides (5 Marks)

Sulphonamides are **bacteriostatic antibiotics** that inhibit bacterial growth by blocking folic acid synthesis, which is essential for bacterial DNA replication. Their pharmacological actions include:

A. Mechanism of Action

- Sulphonamides **inhibit dihydropteroate synthase**, an enzyme required for folic acid synthesis in bacteria.
- This prevents the formation of **tetrahydrofolic acid**, a key component for bacterial DNA and RNA synthesis.
- Human cells are unaffected as they obtain folic acid from diet, whereas bacteria must synthesize it.

B. Antimicrobial Spectrum

- Effective against **Gram-positive** and **Gram-negative bacteria** (e.g., **E. coli**, **Streptococcus**, **Staphylococcus**).
- Used for **urinary tract infections (UTIs)**, **respiratory tract infections**, **toxoplasmosis**, **malaria**, and **ulcerative colitis**.

C. Types of Sulphonamides and Their Uses

1. **Short-acting** – Sulfisoxazole (for UTIs)
2. **Intermediate-acting** – Sulfamethoxazole (combined with Trimethoprim as Cotrimoxazole for UTIs, pneumonia)
3. **Long-acting** – Sulfadoxine (used in malaria treatment)
4. **Topical** – Silver Sulfadiazine (for burns), Sulfacetamide (for eye infections)
5. **Intestinal** – Sulfasalazine (for ulcerative colitis and Crohn's disease)

D. Pharmacokinetics

- **Absorption:** Well absorbed orally
 - **Distribution:** Distributed in body fluids, crosses placenta and blood-brain barrier
 - **Metabolism:** Primarily metabolized in the liver
 - **Excretion:** Excreted through urine (renal elimination)
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2. Nurse's Responsibilities in Administering Sulphonamides (5 Marks)

A. Before Administration

1. **Assess for Allergies:** Check for sulpha drug allergies (e.g., rash, breathing difficulty).
2. **Review Medical History:** Avoid in patients with **G6PD deficiency** (risk of hemolysis) and kidney disease.
3. **Monitor Baseline Parameters:** Check **renal function (BUN, creatinine)** and liver function tests.

B. During Administration

1. **Give with Plenty of Fluids:** To prevent **crystalluria** (kidney stones), encourage at least **1.5-2L of water per day**.
2. **Monitor for Side Effects:**
 - **Common:** Nausea, vomiting, diarrhea
 - **Serious:** Stevens-Johnson Syndrome (severe skin reaction), blood disorders (anemia, leukopenia)
3. **Administer with Food if Needed:** Some sulphonamides may cause GI irritation.

C. After Administration

1. **Monitor for Allergic Reactions:** Watch for **rash, itching, fever, anaphylaxis**.
2. **Check Urine Output:** Ensure **kidney function is normal** and no signs of renal toxicity.
3. **Educate the Patient:**
 - Complete the full course of antibiotics to prevent resistance.
 - Avoid **direct sunlight** (risk of **photosensitivity**).

D. Special Considerations

- **Avoid in Pregnancy & Infants** – Risk of **kernicterus** (bilirubin accumulation in the brain).
- **Monitor Blood Counts** – Long-term use can cause **bone marrow suppression**.

Conclusion

Sulphonamides are **effective antibacterial drugs**, but require careful monitoring for **side effects and allergies**. Nurses play a critical role in **safe administration, patient education, and preventing complications**.

Q2. SHORT NOTE ON:-

(a) Antimalarial Drugs

:- Short Notes on Antimalarial Drugs (5 Marks)

Antimalarial drugs are used to prevent and treat **malaria**, a disease caused by *Plasmodium* parasites, transmitted by **Anopheles mosquitoes**.

1. Classification of Antimalarial Drugs

A. Based on Mode of Action

1. **Blood Schizonticides** (Act on Erythrocytic Stage) – Used for treatment
 - **Examples:** Chloroquine, Artemisinin-based combination therapies (ACTs), Quinine, Mefloquine
2. **Tissue Schizonticides** (Act on Liver Stage) – Used for prevention
 - **Examples:** Primaquine, Tafenoquine
3. **Gametocidal Drugs** (Prevent Transmission by Killing Gametocytes)

- **Examples:** Primaquine (for *P. falciparum*)

4. **Hypnozoitocidal Drugs** (Eliminate Dormant Liver Forms of *P. vivax* and *P. ovale*)

- **Example:** Primaquine

B. Based on Drug Type

1. **Quinoline Derivatives** – Chloroquine, Quinine, Mefloquine
2. **Antifolates** – Sulfadoxine-Pyrimethamine
3. **Artemisinin Compounds** – Artemether, Artesunate (Used in ACTs)

2. Pharmacological Actions

- Inhibit parasite **DNA synthesis** or disrupt **hemoglobin metabolism**, leading to parasite death.
- **Artemisinin-based Combination Therapies (ACTs)** are the first-line treatment for *P. falciparum* malaria.

3. Nurse's Responsibilities

1. **Monitor for Side Effects** – Chloroquine can cause **retinopathy**, Quinine may cause **cinchonism** (tinnitus, dizziness).
2. **Ensure Proper Dosage** – Prevent drug resistance.
3. **Educate the Patient** – Importance of completing the full course, **malaria prevention measures** (mosquito nets, repellents).

Antimalarial drugs play a crucial role in malaria **treatment, prevention, and eradication programs**.

(B) Antacid

:- Short Note on Antacids (5 Marks)

Definition:

Antacids are **alkaline substances** that **neutralize stomach acid (HCl)** to relieve symptoms of **acid reflux, gastritis, and peptic ulcers**.

1. Types of Antacids

A. Systemic Antacids (Absorbed into the bloodstream)

- **Example:** Sodium bicarbonate
- **Rapid action but can cause alkalosis and sodium overload**

B. Non-Systemic Antacids (Not absorbed, act locally)

- **Aluminum-based** – **Aluminum hydroxide** (causes constipation)
- **Magnesium-based** – **Magnesium hydroxide** (causes diarrhea)
- **Calcium-based** – **Calcium carbonate** (provides calcium but may cause rebound acid secretion)
- **Combination Antacids** – **Maalox, Gelusil** (balance side effects of aluminum & magnesium)

2. Pharmacological Action

- Neutralize stomach acid to increase **gastric pH**.
- Reduce **pepsin activity**, protecting the stomach lining.
- Provide **symptomatic relief** but do not treat the underlying cause of ulcers.

3. Nurse's Responsibilities

1. **Administer after meals** for prolonged action.
2. **Avoid long-term use** to prevent **electrolyte imbalance**.
3. **Monitor for Side Effects:**
 - Constipation (Aluminum-based)
 - Diarrhea (Magnesium-based)
4. **Avoid in Renal Failure Patients** (risk of magnesium or aluminum accumulation).

Antacids provide **quick relief** from acidity but are often used alongside **proton pump inhibitors (PPIs)** or **H2 blockers** for long-term acid control.

(C) Non-steroidal anti-inflammatory drugs.

:- Short Note on Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) (5 Marks)

Definition:

Non-Steroidal Anti-Inflammatory Drugs (**NSAIDs**) are medications that reduce **pain, inflammation, and fever** by inhibiting **cyclooxygenase (COX) enzymes**, which produce prostaglandins.

1. Classification of NSAIDs

A. Non-Selective COX Inhibitors (Inhibit COX-1 & COX-2)

- **Examples:** Aspirin, Ibuprofen, Diclofenac, Naproxen, Indomethacin
- **Effects:** Anti-inflammatory, analgesic, and antipyretic
- **Side Effects:** Gastric irritation, ulcers, kidney damage

B. Selective COX-2 Inhibitors

- **Examples:** Celecoxib, Etoricoxib
- **Effects:** Reduced inflammation with fewer gastric side effects
- **Side Effects:** Increased risk of cardiovascular diseases

2. Pharmacological Actions

- **Anti-inflammatory** – Reduces swelling and pain in arthritis, injuries.
- **Analgesic (Pain relief)** – Used in headaches, menstrual cramps, muscle pain.
- **Antipyretic (Fever reduction)** – Lowers fever in infections.

- **Anti-platelet Effect** – Aspirin prevents blood clot formation.

3. Nurse's Responsibilities

1. **Administer with Food** – To reduce **gastric irritation and ulcer risk**.
2. **Monitor for Side Effects** – Watch for **gastric bleeding, kidney impairment, and allergic reactions**.
3. **Avoid in Patients with Peptic Ulcers & Kidney Disease** – NSAIDs can worsen these conditions.
4. **Educate Patients** – Avoid alcohol and long-term NSAID use without medical supervision.

NSAIDs are widely used for **pain relief and inflammation** but require careful monitoring due to **gastric, renal, and cardiovascular risks**.

(D) Oral-Contraceptives.

: - Short Note on Oral Contraceptives (5 Marks)

Definition:

Oral contraceptives (OCPs) are hormonal pills used to **prevent pregnancy** by inhibiting ovulation, altering cervical mucus, and modifying the uterine lining.

1. Types of Oral Contraceptives

A. Combined Oral Contraceptives (COCs)

- Contain **Estrogen (Ethinyl Estradiol) + Progestin (Levonorgestrel, Norethindrone)**.
- **Mechanism:** Suppress ovulation by inhibiting **FSH & LH**, thicken cervical mucus, and alter the endometrium.
- **Examples:** Microgynon, Yasmin.

B. Progestin-Only Pills (Mini-Pills)

- Contain only **progestin (e.g., Norethindrone, Desogestrel)**.
- Suitable for **breastfeeding women** and those at risk of estrogen-related complications.
- Less effective in **suppressing ovulation** but mainly acts by **thickening cervical mucus**.

2. Benefits of Oral Contraceptives

- Highly effective in preventing pregnancy.
- Regulates menstrual cycles and reduces menstrual pain.
- Lowers the risk of **ovarian and endometrial cancers**.
- Helps in conditions like **PCOS and acne**.

3. Nurse's Responsibilities

1. **Educate on Proper Use** – Take daily at the same time for effectiveness.

2. **Monitor for Side Effects** – Nausea, weight gain, mood changes, increased risk of **blood clots** (especially in smokers).
3. **Assess for Contraindications** – Avoid in women with **hypertension, smoking (age >35), or history of thromboembolism.**
4. **Advise on Missed Pills** – Take missed pill ASAP and use backup contraception if necessary.

Oral contraceptives are an effective and widely used birth control method, but require proper counseling and monitoring.

Q3. Short Answer questions.

(a) State any 4 anti-tuberculin drugs.

:- Four Anti-Tubercular Drugs (2 Marks)

1. **Isoniazid (INH)** – Inhibits mycolic acid synthesis, essential for bacterial cell walls.
2. **Rifampicin (RIF)** – Inhibits bacterial RNA synthesis.
3. **Pyrazinamide (PZA)** – Disrupts bacterial membrane metabolism.
4. **Ethambutol (EMB)** – Inhibits arabinosyl transferase, affecting cell wall synthesis.

These drugs are commonly used in **combination therapy (DOTS)** to treat **tuberculosis (TB)** effectively.

(B) Name any four common side effects of antihistamine drugs.

:- Four Common Side Effects of Antihistamine Drugs (2 Marks)

1. **Drowsiness & Sedation** – Especially with first-generation antihistamines like **Diphenhydramine.**
2. **Dry Mouth** – Due to **anticholinergic effects.**
3. **Dizziness** – Can cause balance issues and lightheadedness.
4. **Gastrointestinal Upset** – Nausea, vomiting, or constipation.

Note: Newer antihistamines (e.g., Loratadine, Cetirizine) cause **less sedation** than older ones.

(C) Name any two nurse's responsibilities before administering oral hypoglycemic agents.

:- Two Nurse's Responsibilities Before Administering Oral Hypoglycemic Agents (2 Marks)

1. **Monitor Blood Glucose Levels** – Check **fasting and postprandial blood sugar** to avoid hypoglycemia or hyperglycemia.
2. **Assess for Contraindications** – Ensure the patient has no **kidney/liver disease, allergies, or drug interactions** that may affect medication safety.

Proper assessment helps prevent **complications like hypoglycemia, organ damage, and drug interactions.**

(D) What are Bronchodilators.

Bronchodilators

Definition:

Bronchodilators are **medications that relax and widen (dilate) the airways (bronchi and bronchioles)**, making breathing easier for patients with respiratory conditions like **asthma, chronic bronchitis, and COPD**.

Types of Bronchodilators

1. **Beta-2 Adrenergic Agonists** – Stimulate β_2 receptors, relaxing airway muscles.
 - **Examples:** Salbutamol, Terbutaline, Formoterol
2. **Anticholinergics** – Block acetylcholine, preventing bronchoconstriction.
 - **Examples:** Ipratropium, Tiotropium
3. **Methylxanthines** – Relax smooth muscles and improve diaphragm function.
 - **Example:** Theophylline

Uses:

- **Treat asthma, COPD, bronchospasm**
- **Relieve wheezing, shortness of breath**
- **Improve airflow in obstructed lungs**

Bronchodilators are available as **inhalers, tablets, or injections** and should be used with caution to avoid side effects like **tachycardia, tremors, and dry mouth**.

(E) Succinyl choline and its uses.

 \therefore Succinylcholine and Its Uses (2 Marks)

Succinylcholine is a **depolarizing neuromuscular blocker** used to induce **muscle paralysis** for short durations. It works by **mimicking acetylcholine** at the neuromuscular junction, causing sustained depolarization and muscle relaxation.

Uses of Succinylcholine:

1. **Rapid Sequence Intubation (RSI)** – Facilitates **endotracheal intubation** during emergency airway management.
2. **General Anesthesia** – Provides **muscle relaxation** during surgery.
3. **Electroconvulsive Therapy (ECT)** – Prevents **injuries due to muscle contractions**.
4. **Short Procedures** – Used in **bronchoscopy, laryngoscopy** to relax muscles.

Note: Succinylcholine has a **rapid onset (30-60 sec)** and **short duration (5-10 min)** but can cause **malignant hyperthermia and hyperkalemia** in some patients.

SECTION- B (Pathology and Genetics)

Q4. Etiopathogenesis of peptic ulcer and complications of the disease.

 \therefore Etiopathogenesis and Complications of Peptic Ulcer (12 Marks)

1. Definition of Peptic Ulcer

A **peptic ulcer** is a localized **erosion of the gastric or duodenal mucosa** due to an imbalance between aggressive and protective factors in the stomach.

2. Etiopathogenesis of Peptic Ulcer (6 Marks)

The development of peptic ulcers is influenced by **aggressive factors** (which damage the mucosa) and **protective factors** (which protect the mucosa).

A. Aggressive Factors (Cause Mucosal Damage)

1. **Helicobacter pylori Infection** – Produces **urease**, which increases gastric pH and damages mucosal lining.
2. **Excess Gastric Acid (HCl) Secretion** – Due to **stress, Zollinger-Ellison syndrome**, or high gastrin levels.
3. **Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)** – Inhibit **prostaglandins**, reducing mucus and bicarbonate protection.
4. **Smoking & Alcohol** – Increase acid production and impair healing.
5. **Spicy Foods & Stress** – Can worsen symptoms but are not primary causes.

B. Protective Factors (Prevent Ulcer Formation)

1. **Mucus & Bicarbonate Secretion** – Neutralize acid.
2. **Prostaglandins** – Promote mucosal blood flow and healing.
3. **Epithelial Regeneration** – Repairs damaged mucosa.

When **aggressive factors overpower protective mechanisms**, mucosal damage occurs, leading to **gastric or duodenal ulcers**.

3. Complications of Peptic Ulcer (6 Marks)

If left untreated, peptic ulcers can lead to severe complications:

1. Gastrointestinal Bleeding

- Most common complication, due to **erosion of blood vessels**.
- Symptoms: **Hematemesis (vomiting blood), melena (black stools), anemia**.

2. Perforation

- Ulcer **penetrates through the stomach or duodenal wall**, creating an opening.
- Leads to **peritonitis (severe infection and inflammation of the abdominal cavity)**.
- Symptoms: **Severe abdominal pain, rigidity, and shock**.

3. Gastric Outlet Obstruction

- Chronic ulcers cause **scarring and narrowing of the pyloric region**, blocking food passage.
- Symptoms: **Vomiting, bloating, early satiety, weight loss**.

4. Penetration into Nearby Organs

- Ulcer **extends into the pancreas, liver, or biliary tract**, causing severe pain.
- Symptoms: **Persistent, severe pain not relieved by food or antacids.**

5. Malignant Transformation (Rare)

- Chronic gastric ulcers may **increase the risk of gastric cancer.**

Conclusion:

Peptic ulcers result from **H. pylori infection, NSAIDs, and hyperacidity**, leading to complications like **bleeding, perforation, and obstruction**. **Early diagnosis and treatment** are crucial to prevent life-threatening outcomes.

Q5. Write Short Notes :-

(a) Necrosis

:- Necrosis (5 Marks)

1. Definition:

Necrosis is the **uncontrolled and pathological death of cells or tissues** due to **injury, infection, or lack of blood supply (ischemia)**. It is an **irreversible** process that leads to **inflammation**.

2. Causes of Necrosis:

1. **Ischemia (Lack of Blood Supply)** – Example: Myocardial infarction (heart attack).
 2. **Infections** – Bacterial or viral infections causing tissue destruction.
 3. **Toxins & Chemicals** – Exposure to poisons, drugs, or radiation.
 4. **Trauma** – Physical injury leading to tissue death.
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3. Types of Necrosis:

1. **Coagulative Necrosis** – Common in **heart, kidney**, caused by ischemia.
 2. **Liquefactive Necrosis** – Seen in **brain infarcts, abscesses**, where tissue liquefies.
 3. **Caseous Necrosis** – Cheese-like appearance, found in **tuberculosis (TB)**.
 4. **Fat Necrosis** – Found in **pancreatitis**, affects fat-rich tissues.
 5. **Gangrenous Necrosis** – Affects **limbs, intestines**, due to severe ischemia or infection.
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4. Complications of Necrosis:

- **Inflammation & Infection** – Leads to abscess formation.
- **Loss of Function** – Affected organ loses its ability to work properly.

- **Tissue Breakdown** – Can result in **gangrene**, requiring amputation.

Necrosis is a **serious condition** requiring **medical intervention** to prevent further complications.

(B) Different between benign and malignant tumors.

:- Difference Between Benign and Malignant Tumors (5 Marks)

Feature	Benign Tumor	Malignant Tumor
Definition	Non-cancerous growth that does not invade nearby tissues.	Cancerous growth that invades and spreads to other parts of the body.
Growth Rate	Slow and localized.	Rapid and uncontrolled.
Invasiveness	Well-defined, does not invade surrounding tissues.	Invades nearby tissues and organs.
Metastasis	Does not spread to distant sites.	Spreads (metastasizes) through blood or lymph.
Cell Appearance	Normal-looking, well-differentiated cells.	Abnormal, poorly differentiated cells.
Recurrence	Rarely recurs after removal.	Often recurs even after treatment.
Treatment	Surgical removal is usually sufficient.	Requires surgery, chemotherapy, or radiation therapy.

Conclusion:

Benign tumors are **non-cancerous** and remain localized, while **malignant tumors are cancerous**, spread aggressively, and require intensive treatment.

(C) Genetic Counselling.

:- Genetic Counselling (5 Marks)

1. Definition:

Genetic counseling is a **process of providing information and support** to individuals or families at risk of **inheriting genetic disorders**. It helps them understand the **genetic basis, risks, and available options** for managing or preventing genetic conditions.

2. Objectives of Genetic Counseling:

1. **Assess Risk** – Identify chances of inheriting or passing on genetic diseases.
2. **Provide Information** – Explain the **causes, symptoms, and management** of genetic disorders.
3. **Support Decision-Making** – Guide couples or individuals on reproductive choices.
4. **Psychological Support** – Help families cope with genetic diagnoses.

3. Indications for Genetic Counseling:

- Family history of **genetic disorders** (e.g., thalassemia, sickle cell anemia).
- **Advanced maternal age** (≥ 35 years) – Increased risk of chromosomal abnormalities.
- **Consanguineous marriages** – Higher risk of inherited diseases.
- Previous child with **congenital anomalies** or genetic diseases.

4. Ethical Issues in Genetic Counseling:

- **Confidentiality & Privacy** – Patient data must be protected.
- **Informed Consent** – Individuals should understand risks before testing.
- **Psychological Impact** – Avoid causing distress or stigma.
- **Genetic Discrimination** – Employers or insurers should not misuse genetic information.

5. Conclusion:

Genetic counseling is essential in **preventing genetic diseases, guiding reproductive decisions, and providing emotional support** to affected families.

(D) BLOOD GROUP

:- Blood Group (5 Marks)

1. Definition:

Blood group refers to the **classification of blood based on the presence or absence of specific antigens** (A, B) on red blood cells and antibodies in the plasma. The most commonly used blood grouping systems are the **ABO system and Rh system**.

2. ABO Blood Group System:

Based on the presence of **A and B antigens** on red blood cells and corresponding **antibodies** in the plasma.

Blood Group	Antigen on RBC	Antibody in Plasma	Can Receive Blood From	Can Donate Blood To
A	A	Anti-B	A, O	A, AB
B	B	Anti-A	B, O	B, AB
AB	A & B	None	A, B, AB, O	AB
O	None	Anti-A & Anti-B	O	A, B, AB, O (Universal Donor)

3. Rh Blood Group System:

- **Rh Positive (Rh^+)** – Has **Rh antigen** (Can receive Rh^+ or Rh^- blood).
- **Rh Negative (Rh^-)** – Lacks Rh antigen (Can only receive Rh^- blood).

Example: A person with blood type **A+** has **A antigen and Rh factor**.

4. Importance of Blood Grouping:

- **Blood Transfusion Compatibility** – Prevents **hemolytic reactions**.
- **Pregnancy and Rh Incompatibility** – Rh-negative mothers carrying Rh-positive babies need **Rh immunoglobulin (RhIg)** to prevent complications.
- **Organ Transplantation** – Matching blood groups is necessary to avoid rejection.

Conclusion:

Blood grouping is **vital in transfusions, pregnancy care, and organ donation**, ensuring **safe medical practices** and preventing life-threatening reactions.

(E) causes of congenital abnormalities.

:- Causes of Congenital Abnormalities (5 Marks)

Congenital abnormalities (birth defects) are **structural or functional defects** present at birth due to **genetic, environmental, or unknown factors**.

1. Genetic Causes (Inherited or Mutations)

- **Chromosomal Abnormalities** – Extra or missing chromosomes (e.g., **Down syndrome - Trisomy 21**).
- **Gene Mutations** – Alteration in specific genes (e.g., **Cystic Fibrosis, Sickle Cell Anemia**).
- **Familial Inheritance** – Some conditions run in families (e.g., **Thalassemia**).

2. Environmental Causes (Teratogens - External Factors Affecting Fetal Development)

- **Infections During Pregnancy** – Rubella, Toxoplasmosis, Cytomegalovirus (CMV) can cause defects.
- **Drugs & Chemicals** – Exposure to alcohol (**Fetal Alcohol Syndrome**), certain medications (e.g., Thalidomide, Retinoids).
- **Radiation Exposure** – Can cause mutations leading to malformations.
- **Maternal Health Conditions** – Diabetes, malnutrition, or thyroid disorders affect fetal development.

3. Multifactorial Causes (Combination of Genetic & Environmental Factors)

- **Cleft Lip & Palate** – Caused by genetic predisposition + maternal smoking or infections.
- **Neural Tube Defects (Spina Bifida, Anencephaly)** – Linked to **folic acid deficiency** + genetic factors.

4. Unknown Causes

- In many cases, the **exact cause remains unknown** due to complex interactions between genes and the environment.

Conclusion:

Congenital abnormalities arise from **genetic mutations, teratogens, maternal health conditions, or unknown factors. Early screening, prenatal care, and avoiding harmful exposures** can help prevent birth defects.

(F) Down Syndrome

Refer to 2022 Q4. (c)