1. What is Immunization?

Immunization is the process of protecting individuals from infectious diseases by stimulating the body's immune system to recognize and fight pathogens (viruses, bacteria, parasites).

It can occur:

- Naturally – when a person becomes infected and develops immunity.
- Artificially – through vaccination, which introduces weakened, killed, or parts of microorganisms to trigger an immune response without causing disease.

Immunization is one of the most effective public health interventions globally.

2. What is a Vaccine?

A vaccine is a biological preparation that trains the immune system to fight a disease.

Types include:

1. Live attenuated vaccines – weakened organisms (e.g., measles, BCG, OPV).
2. Inactivated (killed) vaccines – dead pathogens (e.g., IPV, Hepatitis A).
3. Toxoid vaccines – inactivated toxins (e.g., Tetanus, Diphtheria).
4. Subunit/Conjugate vaccines – specific parts of pathogens (e.g., Hib, HPV).
5. mRNA vaccines – genetic instructions to make a harmless protein (e.g., COVID-19 mRNA vaccines).
6. Viral vector vaccines – harmless virus carrying genetic material (e.g., AstraZeneca COVID-19).

3. How Immunization Works (Simple Explanation)

1. Vaccine enters the body.
2. Immune system identifies it as foreign.
3. White blood cells produce antibodies and memory cells.
4. Memory cells persist and respond quickly if the real pathogen appears.

This prevents:

- Infection,
- Complications,
- Death,
- Spread of disease.

4. Types of Immunity

Active Immunity

Body produces its own antibodies.

- Long-lasting (years or lifelong).
- Gained through vaccination or natural infection.

Passive Immunity

Ready-made antibodies are given.

- Short-lived (weeks to months).
- Examples: maternal antibodies, immunoglobulin therapy.

5. Importance of Immunization

- Prevents deadly childhood diseases.
- Reduces outbreak risk.
- Protects vulnerable populations (newborns, immunocompromised people).
- Eliminates or eradicates diseases (e.g., smallpox).
- Reduces healthcare costs.
- Contributes to longer life expectancy.

6. Common Vaccine-Preventable Diseases

- Tuberculosis (TB) – BCG
- Polio – OPV/IPV
- Measles
- Diphtheria, Tetanus, Pertussis – DTP/Penta
- Hepatitis B
- Haemophilus influenzae type b (Hib)
- Pneumococcal diseases
- Yellow Fever
- Meningitis A
- Rotavirus
- HPV (Cervical cancer prevention)
- COVID-19 (recent addition)

7. Routine Immunization Schedule (General Framework)

Different countries vary, but WHO/EPI schedule commonly includes:

At Birth

- BCG
- Hepatitis B birth dose
- OPV 0 (in countries that use OPV)

6, 10, 14 Weeks

- Penta (DTP-HepB-Hib)
- OPV
- PCV
- Rotavirus

9 Months

- Measles-Rubella
- Yellow Fever

15–18 Months / Preschool

- Second dose of Measles
- Booster doses (depending on country)

Adolescent & Adult Immunization

- HPV (9–14 years)

- Tetanus boosters
- Hepatitis B
- Influenza (annual for adults, elderly)
- COVID-19

8. Herd Immunity

Occurs when a large portion of a population is immunized, reducing disease spread.

Protects those who cannot be vaccinated, such as:

- infants,
- pregnant women (specific vaccines),
- immunocompromised individuals.

Threshold depends on disease; e.g., measles requires > 95% coverage.

9. Monitoring & Evaluation in Immunization

This is important for supervisors, independent monitors, and field teams.

Key Indicators

- Vaccine coverage rates
- Drop-out rates (e.g., Penta1 to Penta3)
- Availability of cold-chain equipment
- Vaccine storage conditions
- Community awareness and demand generation

- Recording & reporting accuracy
- Adverse events following immunization (AEFI) monitoring

Data Tools

- Child immunization registers
- Tally sheets
- Summary forms
- Electronic immunization registry (if available)

10. Cold Chain in Immunization

Vaccines require specific temperatures to stay effective.

Temperature Ranges

- Most vaccines: +2°C to +8°C
- Freezing should be avoided for vaccines like Penta, PCV, HepB.
- Some vaccines (like OPV) require storage below zero for long-term preservation.

Cold Chain Equipment

- Refrigerators
- Vaccine carriers
- Cold boxes
- Ice packs
- Temperature monitoring devices (thermometers, data loggers)

If cold chain breaks, vaccines may lose potency.

11. Safety in Immunization

Common Mild Reactions

- Pain at injection site
- Fever
- Irritability
- Swelling

Severe Reactions (Rare)

- Anaphylaxis
- Severe allergic reactions
- High fever or seizures

Healthcare workers must report and manage AEFI properly.

12. Reasons Caregivers May Refuse or Delay Vaccination

- Misinformation or fear
- Cultural or religious beliefs
- Lack of awareness
- Access issues (distance, cost, time)
- Negative past experiences

- Poor communication from health workers

Effective community engagement is essential.

13. Immunization Campaigns

These are periodic mass vaccination programs for diseases such as:

- Polio (NIPDs/SIPDs)
- Measles follow-up campaigns
- Meningitis A campaigns
- Yellow fever campaigns

Independent monitors play a key role in checking:

- Team performance
- Household coverage
- Missed children
- Supervision and logistics
- Vaccine accountability

14. Immunization Challenges in Low- and Middle-Income Countries

- ☐ Vaccine stock-outs
- ☐ Cold chain failure

- ☐ Staff shortage
- ☐ Insecurity or hard-to-reach areas
- ☐ Low community acceptance
- ☐ Inaccurate data reporting
- ☐ Poor supervision
- ☐ Funding constraints

PREVENTION OF DISEASES THROUGH. IMMUNIZATION

Prevention through immunization refers to the use of vaccines to protect individuals and populations from infectious diseases. It is a primary prevention strategy aimed at stopping infection before it occurs.

2. Core Principle

Vaccines stimulate the immune system to produce antibodies and memory cells. This enables rapid recognition and elimination of a pathogen upon exposure, preventing illness, complications, disability, and death.

3. Prevention Mechanisms

A. Individual Protection

- **Reduces risk of contracting vaccine-preventable diseases.**
- **Lowers severity when breakthrough infection occurs.**
- **Prevents long-term sequelae (e.g., paralysis from polio, liver disease from Hepatitis B).**

B. Community Protection (Herd Immunity)

- **When a high proportion of the population is immunized, transmission decreases.**
- **Protects those who cannot be vaccinated (infants, immunocompromised individuals).**
- **Helps eliminate or eradicate diseases.**

4. Diseases Prevented by Immunization

Key vaccine-preventable conditions include:

- **Polio**
- **Measles**
- **Tuberculosis**
- **Diphtheria**
- **Pertussis**
- **Tetanus**
- **Hepatitis B**
- **Haemophilus influenzae type b**
- **Meningococcal meningitis**
- **Pneumococcal disease**
- **Yellow Fever**
- **Rotavirus**
- **HPV**
- **COVID-19**

5. Preventive Tools and Strategies

A. Routine Immunization

Administered at scheduled ages to maintain continuous protection in the population.

B. Supplemental Immunization Activities (Campaigns)

Used to rapidly boost immunity in at-risk populations or during outbreaks.

C. Catch-Up Immunization

Targets individuals who missed routine doses, ensuring no one remains vulnerable.

D. Booster Doses

Restore immunity that declines over time, preventing lapses in protection.

6. System Requirements for Effective Prevention

- **Adequate vaccine supply**
- **Functional cold chain (2–8°C for most vaccines)**
- **Skilled immunization workforce**
- **Accurate recording and reporting**
- **Community engagement and caregiver education**
- **Surveillance for outbreaks and vaccine-preventable diseases**
- **Monitoring for adverse events following immunization (AEFI)**

7. Barriers to Prevention

- **Vaccine hesitancy**
- **Stock-outs and logistics failures**
- **Inadequate awareness**
- **Access constraints in remote or insecure areas**
- **Poor service quality or weak supervision**

Each barrier reduces coverage and undermines disease prevention.

8. Expected Outcomes of Effective Immunization

- **Decline in morbidity and mortality from vaccine-preventable diseases**
- **Fewer outbreaks**
- **Reduced healthcare burden**
- **Long-term elimination of pathogens in the population**