1. Definition & Objectives of Epidemiology
Definition: Epidemiology is the study of the distribution and determinants of health-related states or events in populations, and the application of this study to control health problems.

Objectives:
- Identify the cause of diseases
- Determine disease frequency and distribution
- Study the natural history of diseases
- Evaluate public health interventions
- Inform policy and preventive strategies

2. Descriptive vs Analytical Epidemiology
Descriptive: Describes the "who, what, when, and where" of health events.
Example: Mapping malaria cases in a community.
Analytical: Explores the "why and how" by studying causes and risk factors.
Example: Studying if mosquito nets reduce malaria cases.

3. Epidemiologic Triangle

Components:

- Agent (cause of disease, e.g., virus)
- Host (human/animal affected)
- Environment (external factors aiding transmission)

Interaction: Disease spreads when an agent infects a host under favorable environmental conditions.

4. Determinants in Epidemiology

Definition:Factors that influence health or disease outcomes.

- Biological Examples: Age, immune status
- Environmental Examples: Poor sanitation, climate

5. Levels of Prevention

1. Primary – Prevent disease before it occurs

   Example: Vaccination
2. Secondary – Detect early and treat to stop progression

   Example: Breast cancer screening
3. Tertiary – Reduce impact of established disease

   Example: Physiotherapy after stroke

6. John Snow's Contribution

John Snow is the father of modern epidemiology.

- He mapped cholera cases in London (1854)
- Identified a contaminated "water pump" as the source
- Removed the pump handle, and cases declined

→ First use of "epidemiologic investigation" and mapping.

7. Incidence vs Prevalence

- Incidence: New cases in a given time
- Prevalence: All existing cases at a point in time

Importance:

- Incidence shows risk of disease
- Prevalence shows disease burden (e.g., managing diabetes resources)

8. Study Designs

Types:

- Cross-sectional
- Cohort
- Case-control
- Experimental

Cohort Study: Follows a group over time

(prospective)
Case-Control Study: Compares past exposure in diseased vs healthy groups (retrospective)

9. Relative Risk (RR) vs Odds Ratio (OR)
- RR: Risk of disease in exposed vs non-exposed
  Used in cohort studies
- OR: Odds of exposure in cases vs controls
  Used in case-control studies
Difference: RR is more direct; OR estimates risk when RR can't be used.

10. Role of Epidemiological Surveillance
Surveillance is the continuous collection and analysis of health data.
Use:
- Detect outbreaks early
- Track disease trends
- Guide resource allocation
- During epidemics (e.g. Ebola, COVID-19), it helps in early intervention and control