1. Definition and Main Objectives of Epidemiology

Definition:

Epidemiology is the study of how diseases and health related conditions are distributed in a population.

Main Objectives:

1. To describe the health status of population by identifying pattern and frequencies of disease, involving who, (the person), where (the place where it occurred) and when (the period that it occurred).

2. To determine the trend of the disease.

3. To identify the cause of the disease.

4. To predict the occurrence of disease by estimating risk and forecasting future trends

5. To control and prevent disease by informing health policy intervention and health promotion strategies

Descriptive Epidemiology:

Focuses on what, who, when, and where, it describes the pattern of disease occurrence.

Analytical Epidemiology:

focus on how and why, it investigates causes and risk factors for disease.

Example: A study comparing people living in bushy environment and those not living in bushy environment to identify malaria risk factors.

3. Components of the Epidemiologic Triangle

The triangle has three components:

1. Agent: The microorganism or factor that causes disease (e.g., Plasmodium for malaria).

2. Host: The organism harboring the disease (e.g., humans).

3. Environment: External factors that facilitate transmission (e.g., presence of mosquitoes, poor sanitation and bushy environment.

Interaction:

Disease occurs when a susceptible host encounters a sufficient amount of an infectious agent in a conducive environment.

4. Determinants in Epidemiology

Definition

Determinants are factors or events that influence the occurrence of disease or other health-related events.

Examples:

Biological determinants: Age, sex, genetics, immunity status

Environmental determinants: Climate, sanitation, water quality, housing conditions.

5. Levels of Prevention

1. Primary Prevention: Prevents disease before it occurs.

Example: Immunization against polio.

2. Secondary Prevention: Detects and treats disease early.

Example: RDT for early detection of malaria.

3. Tertiary Prevention: Reduces complications or disability.

Example: Rehabilitation for stroke patients.

6. John Snow’s Contribution

John Snow, considered the Father of Modern Epidemiology, investigated the 1854 cholera outbreak in London.

He used mapping (spot maps) to identify cases clustered around the Broad Street water pump. After removing the pump handle, the outbreak subsided.

This demonstrated the link between contaminated water and cholera, introducing modern epidemiologic methods of observation and data analysis.

7 Incidence: The number of new cases of a disease in a population during a specific period.

Prevalence: The total number of existing cases (new + old) at a given time.

Importance:

Incidence helps identify risk and causes of diseases.

Prevalence helps measure burden of chronic conditions like diabetes and plan healthcare services.

8. Common Epidemiological Study Designs

Types:

Descriptive studies (case reports, cross-sectional)

Analytical studies (case-control, cohort)

Experimental studies (clinical trials)

Difference:

Cohort Study: Follows exposed and unexposed groups over time to compare disease occurrence → measures relative risk.

Case-Control Study: Compares people with the disease (cases) to those without disease (controls)measures odds ratio.

9 Relative Risk (RR): Ratio of disease incidence in exposed vs unexposed groups (used in cohort

studies).

$$RR = \frac{Incidence_{exposed}}{Incidence_{unexposed}}$$

$$OR = \frac{(a/b)}{(c/d)} = \frac{ad}{bc}$$

RR or OR = 1 → No association

RR or OR > 1 → Positive association (risk factor)

RR or OR < 1 → Protective factor

10. Role of Epidemiological Surveillance

Definition:

Systematic collection, analysis, interpretation, and dissemination of health data for planning, implementation, and evaluation of public health practice.

Roles in Public Health:

Detects disease outbreaks early.

Monitors trends and evaluates interventions.

Guides resource allocation and policy decisions.

During an Emerging Epidemic:

Surveillance helps track transmission patterns, identify high-risk groups, and guide timely public health responses (e.g., Lasal fever contact tracing and reporting by system.l