Epidemiology Test
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1. Definition and Objectives of Epidemiology

Epidemiology is the study of how diseases occur, spread, and affect populations, as well as the factors that determine their distribution. Its main goals are to identify the causes and risk factors of diseases, describe how they are distributed among people, and apply this knowledge to prevent and control health problems. In essence, epidemiology provides the foundation for protecting public health and shaping effective health policies and interventions.


2. Descriptive vs Analytical Epidemiology

Descriptive epidemiology focuses on outlining the patterns of diseases in terms of time, place, and person. It answers the questions "who," "where," and "when." For example, recording malaria cases in various Nigerian regions over a year is a descriptive study.

Analytical epidemiology, on the other hand, investigates the causes and risk factors of diseases. It answers the questions "how" and "why." For instance, examining whether people who live near stagnant water are more likely to contract malaria is an analytical study.


3. Components of the Epidemiologic Triangle

The epidemiologic triangle consists of three main components: the agent, the host, and the environment.

Agent: The microorganism or factor responsible for the disease (e.g., bacteria, viruses, or chemicals).

Host: The human or animal that can become infected.

Environment: The external conditions that influence the transmission of disease, such as climate, sanitation, or living conditions.

These three elements interact continuously. For example, in malaria, the agent is the Plasmodium parasite, the host is the human, and the environment includes mosquitoes and standing water. A change in any one of these components can increase or reduce disease risk.

4. Concept of Determinants in Epidemiology

Determinants are the various factors that influence the health of individuals or populations. They help explain why certain diseases occur.

Biological determinants include genetics, age, and immune status. For example, genetic predisposition to hypertension.

Environmental determinants involve external conditions like air quality, sanitation, or housing. For instance, poor drainage can create breeding grounds for mosquitoes.

Recognizing these determinants is crucial for identifying preventive actions and addressing the root causes of diseases.

5. Levels of Prevention in Public Health

Public health prevention operates on three levels:

Primary prevention aims to stop diseases before they begin. Example: immunization against measles or promoting handwashing.

Secondary prevention focuses on early detection and treatment to prevent disease progression. Example: routine blood pressure checks to identify hypertension early.

Tertiary prevention seeks to minimize the impact of an existing disease. Example: physiotherapy for stroke patients to aid recovery and prevent disability.

6. John Snow's Contribution to Modern Epidemiology

John Snow is widely recognized as the father of modern epidemiology. During the 1854 cholera outbreak in London, he carefully mapped cases and discovered that most were concentrated around the Broad Street water pump. After persuading authorities to remove the pump handle, the outbreak subsided. His approach—collecting data, mapping cases, and using observation to link disease to its source—pioneered the modern scientific method in epidemiological research.

## 7. Incidence vs Prevalence

Incidence measures the number of new cases of a disease that develop within a specific time frame, while prevalence measures the total number of existing cases (both new and old) at a particular point in time.

In chronic diseases such as diabetes, incidence helps identify risk factors and prevention needs, whereas prevalence reveals the overall burden of the disease and guides healthcare planning.

## 8. Common Epidemiological Study Designs

The main types of epidemiological studies include cross-sectional, cohort, case-control, and experimental designs.

A cohort study follows a group of people over time to determine who develops a disease, often used to calculate relative risk (RR).

A case-control study starts with individuals who already have the disease (cases) and compares them with those who don't (controls), often used to calculate the odds ratio (OR).

The major difference is that cohort studies look forward in time, while case-control studies look backward.

## 9. Relative Risk (RR) and Odds Ratio (OR)

Relative Risk (RR) is the ratio of disease probability among the exposed group to that among the unexposed group, commonly used in cohort studies.

Odds Ratio (OR) compares the odds of exposure among cases to those among controls, typically used in case-control studies.

RR provides a direct measure of how much exposure increases disease risk, while OR offers an estimate of that risk, especially useful when the disease is rare.

## 10. Role of Epidemiological Surveillance in Public Health

Epidemiological surveillance is the continuous process of collecting, analyzing, and interpreting health data to guide public health decisions. It helps detect outbreaks early, monitor trends, and assess the success of control measures.

During an epidemic—such as Ebola or COVID-19—surveillance enables quick identification of new cases, contact tracing, and rapid interventions like isolation, vaccination, or movement restrictions. Effective surveillance is crucial for timely response and containment.