Community Dentistry

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Epidemiology

The international epidemiological association defines epidemiology as "the study of the distribution and determinant of health related states and events in the populations and the application of this study to control of health problems". The primary unit of concern is groups of person not individuals**.**

There are many terms used in epidemiology:

 # An outbreak or an epidemic exists when there are more cases of a particular disease than expected in a given area, or among a specific group of people, over a particular period of time.

 # Endemic, when a population has a high level of the disease all the time.

 # Pandemic**:** An epidemic (a sudden outbreak) that becomes very widespread and affects a whole region, a continent, or the world due to a susceptible population.

{A true pandemic causes a high degree of mortality (death)}

Objectives of epidemiology:

1. Describe the distribution and size of disease problems in human populations.
2. Identify etiological factors.
3. To provide the data essential to the planning, implementation, evaluation of services for the prevention, control, treatment, and to the setting up priorities among those services.

Components of epidemiological study:

1. ***Disease frequency:*** Basic measures of disease frequency are *ratio or rate*. It helps to compare disease frequency in different populations or subgroups in relation to suspected causal factors.
2. ***Distribution of disease:*** The basic tenet of epidemiology is that the distribution of disease occurs in patterns which gives a clue to the causative factors. These distribution patterns are studied in terms of time, place and person.

{Study of these variations is called descriptive epidemiology}

3. ***Determinants of disease:*** An unique feature of epidemiology is to test etiological hypothesis and identify the underlying causes of disease. This aspect of epidemiology is known as "analytical epidemiology.

Epidemiological Concept

Disease results from **an imbalance** between the disease agent and the host. The epidemiological concept of disease holds that health and disease in an individual or community are out-coming of the dynamic relationship between the agent, the host and the environment. A state of equilibrium between these factors indicates no disease, any disturbances of this equilibrium brought about by changes in the inherent characteristics of the agent, the host and the environment results in disease.

- **Agents:** Serve as a stimulus to initiate a disease process. The classifications of agents are:

1. **Biological agents:** Viruses, bacteria, fungi, protozoa.
2. **Nutritional factors:** Both excess and deficiencies such as calories, proteins, vitamins.
3. **Chemical agents**: lead, solvents.
4. **Physical agents:** Humidity, vibration, heat, light, cold, radiation.
5. **Mechanical agents:** Explosives, bullets, knives.
6. **Social and psychological stressors:** Smoking, drug abuse, work stress.

- **Human (Host):** The factors which influence the exposure of response include
  - Age.
  - Sex.
  - Family size.
  - Marital status.
  - Religion.
  - Occupation.
  - Inter current disease.
  - Ethnic or racial factors.
  - Habits and customs.
  - Immunity – passive immunity, active immunity.

- **Environment:** Is the sum total of all external conditions and influences that affect the life and development of an organism.

 # It thus influences both the agent and the host.

1. **Biological environment:** Infectious agents of disease, reservoirs of infection, vectors that transmit disease, plants and animals.
2. **Social environment:** The overall economic and political organization of a society and of the institutions by which individuals are integrated into the society at various stages in their lives**.**
3. **Physical environment:** Heat, light, air, water, radiation, chemical agents.

Essential Definition in Epidemiology

❖ **Hypothesis:** It is a supposition arrived of from an observation or reflection. The hypothesis could be tested using the techniques of analytical epidemiology after which it may be accepted or rejected. An epidemiological hypothesis should specify the Population at risk.

❖ **Population at risk:** It is that part of a population which is susceptible to a disease. It can be defined on the basis of demographic or environmental factors. For instance, occupational injuries occur only among working people so the population at risk is the workforce**.**

Epidemiological Approach

Epidemiological study is based on 2 concepts:

1. Asking questions:

A. Related to health events - what is the event, what is its magnitude, where did it occur, when did it occur, who are affected, why did it happen?

B. Related to health action-what can be done to reduce this problem, to prevent it, what action has to be taken by the community, health services, what resources are required, how are the activities to be organized, what difficulties will arise and how to overcome them?

***2. Making Comparisons*:** This the basic approach in epidemiology which lead to identify the major difference between those who have the disease and those who don't have the disease.

Morbidity: Is the term used to describe the percentage of a population which is suffering from a disease at a given point of time. For example, percentage of population suffering from dental caries, the term merely indicates whether or not individual has a disease.

Measurement of disease frequency

There is a need for accurate information on illness (morbidity) and death (mortality) because of the high economic loss, social disturbances as well as the cost of medical care associated with them and to enable comparison within and between societies at a given point in time or over different time periods.

Health is measured by morbidity and mortality statistics.

Tools of measurement in epidemiology

Ratio: A ratio is obtained by dividing one quantity by another without implying any specific relationship between the numerator and the denominator.

$$\text{Ratio} = \frac{\text{Number of (events, item, person, etc.) in one group}}{\text{Number of (events, item, person, etc.) in another group}}$$

Proportion: It is a ratio which indicates the relation in magnitude of a part to the whole. Numerator is included in the denominator. It is usually expressed as percentage. Ex. proportional death rate of a cause to all deaths.

$$\textit{Proportion} = \frac{\text{Number of persons or events with a particular characteristic}}{\text{Total number of persons or events, of which the numerator is a subset}} \times 100$$

- **Defining the time is not required to calculate a proportion.**

Rate: Measure of the frequency with which event occurs in a defined population over a specified period of time. In rate the numerator is a part of denominator.

$$\text{Rate} = \frac{\text{The frequency with which an event has occurred during some specified period of time}}{\text{Number of persons at risk for developing the event during the same period of time.}} \times K$$

* Where the value of K depends on the magnitude of the numerator. Abase of 100 can be used for more common disease, but 1000 is used when convenient and 10000 or 100000 can be used for those less common or rare.

*Defining the time period is very important to calculate the rate.

(Morbidity of a disease is measured by prevalence& incidence)

Prevalence: Refer to the number of all cases (old & new) in a given population at a certain time, divided by the total population during the same time.

$$P = \frac{\text{Number of cases (old \& new) at a certain time}}{\text{Total population during the same time}} \times K$$

Incidence: The number of new cases of certain disease occurring in a given population at a certain period of time, divided by the population at risk for developing that disease during that period.

$$\text{Incidence} = \frac{\text{Total number of new cases during a specified period of time}}{\text{Number of persons who are at risk of developing that disease during that period}} \times K$$