Epidemiology

Epidemiology has been defined as the science concerned with the study of the distribution and determinants of a diseases and other health related events in specified populations, and the application of this study to control of health problems.

Objectives of epidemiology:

1-To describe the distribution and magnitude of disease problems in human populations.

2-To identify etiological (or risk) factors in pathogenesis of a disease.

3-To provide data essential for planning, implementation and evaluation of services for the prevention ,control and treatment of disease.

Strategy of epidemiology:

1. Descriptive epidemiology :It includes description of the distribution of disease ,with comparison of its frequency in different populations and in different segments of the same population.
2. Formulation of hypothesis: tentative theories designed to explain the observed distribution of the disease in term of casual association of the most direct possible cause.
3. Analytic epidemiology: observational studies designed specifically to examine the hypothesis developed as a result of descriptive study.
4. Experimental epidemiology: Experimental studies on human population to test in a stringent manner those hypothesis that resulted from the test of analytic studies.

Hypothesis: is a proposed explanation for a phenomenon. The hypothesis could be tested using the techniques of analytical epidemiology after which it may be accepted or rejected.

Measurement tools in epidemiology:

The basic tools which are usually used to express condition or disease magnitude in epidemiology are:

1-Rate: It measures the occurrence of particular event (disease, death or extraction of teeth) in a population during a given period of time. The numerator is a part of denominator, e.g.

Death rate is calculated as:

$$\text{Death rate} = \frac{\text{Number of death in one year}}{\text{Population}} \times 1000$$

Depending upon the sample size, the sample rate is expressed in per 1000 and rarely per 10,000.

2-Ratio: It expresses a relation in size between two random quantities. The numerator is not a part of the denominator, e.g. ratio of dentist to population is 1:10,000 .

3-Proportion: It is the rate of a part to the whole .The numerator is always included in the denominator .This is expressed in a percentage .e.g :

$$\frac{\text{Number of carious teeth at a certain time}}{\text{Total number of teeth present in the oral cavity at the same time}} \times 100$$

- One of the most commonly used measurements in epidemiology is **Morbidity** which is any departure from a state of physiological well-being.

Measurement of Morbidity:

Morbidity is measured by two aspects: prevalence and incidence

Prevalence: is defined as the number of all cases (old and new) in a defined population at a certain time point or over a period of time divided by population at risk.

$$\mathbf{P} = \frac{\text{number of all cases(old and new)}}{\text{Population at risk (the population Among whom the affected persons are observed)}} \times 100(\text{proportion})$$

There are two types of prevalence:

(1) Point prevalence: measures all current cases of a disease at one point of time in relation to a defined population. The "point" in point prevalence, may consist of day, several days, or even a few weeks depending upon the time it takes to examine the population sample.

(2) Period prevalence: measures all current cases existing during a period of time (annual prevalence) expressed in relation to a defined population.

Incidence: measures the rate of appearance of new cases of a disease in a population divided by the population at risk during a given period of time (usually of a year).

$$\text{Incidence} = \frac{\text{Number of new cases}}{\text{Population at risk}} \times 1000$$