Epidemiological studies

Epidemiological studies are organized into two divisions. These types of epidemiological studies complement one another, which are:

1- Observational epidemiology:

1- Descriptive study.

2- Analytical study.

a- Case-control study.

b- Cohort study.

2- Experimental epidemiology (clinical trials):

1- Randomized control trials.

2- Field trials.

3- Community trials.

1- Observational epidemiology.

1- Descriptive study:

It is one that attempts to do no more than describe the pattern of occurrence of a condition relative to other characteristics of the population. For example, a study that attempted to measure the degree of dental caries in a school relative to the age, gender, and socioeconomic characteristics of the children without attempting to explain why those particular distributions were found. Descriptive studies are usually the first phase of any epidemiological investigation.

It would also be a prevalence study (all current cases; both old and new at a given point of time or over a given period of time) which is commonly used for comparisons between two or more populations, or between the same population at different time.

2- Analytical study:

It is one that attempts to explain the distribution of a condition relative to some other factor. It is most often used in studies to determine the etiology of the disease. For example, measuring the influence of water fluoridation on the distribution of dental caries in a population. Such a study could also be called an incidence study (new cases of a condition over a given period of time).

Types of analytical studies: a- **Case-control study**: it is often called retrospective study used to test hypothesis. The case- control studies have the following distinct features:

1. Both exposure and outcome of the disease have occurred before the start of the study.
2. The study proceeds backward from effect to cause.
3. It uses a control group for comparison.

-Case-control studies are basically comparison study. Cases and controls must be comparable with respect to known factors such as age, sex, occupation etc.One can use cases for children with local fluoride application, and control for children who have not been given such applications.

There are four basic steps in conducting a case control study:

1. Selection of cases and controls.

2.matching:is the process by which one selects controls in way that they are similar to cases with regard to certain pertinent selected variables(eg.age) which are known to influence the outcome of the disease and if not matched could distort the results.

3. Measurement of exposure: this may be obtained by interviews, questionnaire or studying past records.
4. Analysis and interpretation.

b.**Cohort study:** cohort means group of people who share the same characteristics or experience, For instance, a birth cohort includes all people born within a given time frame, this type of analytical study which is usually undertaken to refute or support the existence of an association between suspected causes and the disease, it has the following features:

1. The cohorts are identified prior to the appearance of the disease under investigation.
2. Study groups are followed through time to see which members develop the disease.
3. The study proceeds forwards from cause to effect (prospective study).

Cohort studies have been called by a variety of names including:

a- Incidence studies. b- Prospective studies. c- Follow-up studies. d- Longitudinal studies.

Elements of cohort study:

1. Selection of study subjects.
2. Obtaining data on exposure.
3. Selection of comparison groups.
4. Follow up
5. Analysis.

The differences between Case-control and Cohort studies

Case-control study	Cohort study
1- Retrospective	1- Prospective
2- Disease has already occurred	2- Disease is expected to occur in future
3- Presence of exposure in cases and controls compared	3- Development of disease in exposed and non exposed compared
4- Relatively easy to carry out	4- Time consuming and difficult to carry out
5- Useful for rare cases	5- Suitable for common disease
6- Relatively less costly	6- Expensive
7- No dropouts	7- Dropout rate higher

2- Experimental epidemiology.

Experimental studies are ones where researchers introduce an intervention and study the effects. Experimental studies are usually randomized, meaning the subjects are grouped by chance. Clinical trials are designed to bring out the most appropriate intervention for patients suffering from a given condition. When a new treatment has been developed, it is important to provide the answers to two questions:

1- Does it work?
2- Is it better than the existing treatment?

The studies under this category are as follows:

1- Randomized control trails:

When the investigation is to be carried out in a group of individuals, a parallel group not exposed must also be studied in the same way; this called the control group and should be matched the group under study. It is important to supply the control group with a substance similar in appearance and other properties to that being test; this is called a placebo.

It is always desirable that the investigator should not know whether a subject is a member of test or a control group(the study should be blind). If the subject is also in ignorance of whether he is using a test product or placebo, the study is termed double blind. This is to avoid unconscious bias in the diagnosis.

2- Field trials (randomized uncontrolled):

a- Preventive trials: It is used to estimate the effect of preventive techniques like vaccination.

b- Risk factor trials: It is used when specific risk factors are averted in groups of population, like dietary pattern.

Both randomized control trials and field trials involve individual units of population.

3- Community trials (non-randomized controlled):

Such studies are the only way in which a general intervention like fluoridation has to be tried out for reducing dental caries. Control communities in the neighborhood can be selected for comparison.

Other related terms used to describe types of epidemiological studies are:

1- **Cross-sectional study:**

It is one in which a sample of a population is assessed at one time.

2- **Longitudinal study:**

It is one in which the same group of people is studied on two or more occasion.

Other classifications:

1- Prospective study.

It is one in which the planning of the entire study is carried out before the data are to be collected. For example, measurement the effect of a fluoridated dentifrice in reducing the incidence of dental caries. Measurement of caries at the beginning and the end of the study period allows the incidence of the disease to be determined.

2-Retrospective study.

It is one in which the planning for the study takes place after the data have been collected. For example, to find out what type of feeding was used for the patient over the year, the information could be collected from the clinical records. It is easier and cheaper than planning a prospective study.

Ethical issues

The practice of epidemiology requires basic principles of ethics, these are:

1. People who have been exposed to a health hazard should know that the studies carried out on them may not improve their personal situation but may help to protect thousands of other people.
2. Informed consent must be obtained from participants in studies and they must retain the right to withdraw at any time.
3. Epidemiologists must respect personal privacy and confidentiality at all times.
4. All proposals for epidemiological studies should be submitted to institutional ethics committees before work begins.