

COHORT STUDY

PREVIOUS UQ

1) In a study to assess the relationship between birth weight and infant mortality, 700 babies among 5500 weighed below 2500 grams at birth. They were followed up till they completed their first birthday. Of the 500 infants deaths registered, 350 occurred among babies with normal birth weight.

2) As a medical officer recently recruited in a primary health centre, you find that there is a cotton mill in your area and its workers utilize your health services. You want to investigate whether their health is affected by the work environment.

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- Cohort study is a type of **analytical study** undertaken to obtain **additional evidence to refute or support the existence of an association between suspected cause and disease**.
 - Also called as prospective, longitudinal, incidence or forward-looking study.

Three distinct features of cohort study

- Cohorts are identified prior to appearance of disease under investigation.
- The study groups are observed over period of time to determine frequency of disease.
- The study proceeds forward from cause to effect.

Elements of Cohort Study

- Selection of study subjects
- Obtaining data on exposure
- Selection of comparison group
- Follow-up
- Analysis

Selection of study subject i.e. cohort

General population: When the exposure or cause of death is fairly frequent cohorts may be assembled from the general population i.e., from well-defined geographical, political and administrative area.

Special group

- Select group: e.g. doctors, nurses, school children etc. Advantages: Homogenous and accessible for follow-up
- Exposure group: (High-Risk) - e.g. Industrial group, Radiologist

Obtaining data on exposure

Data collection methods are:

- Personal interviews or mailed questionnaire
- Review of records
- Medical exam or special test
- Environmental survey

Information about exposures should be collected based on

- Whether exposed or Unexposed
- Level and degree of exposure

Selection of comparison group

i) Internal comparison: (Within group)

- Can be stratified according to level of exposure & duration e.g. Smoking, B.P., Serum Cholesterol before occurrence

ii) External comparison:

- It is done when degree of exposure is not known e.g. Smoker & non smoker

iii) Comparison with general population rate

- If data is not available then compare with general population.

Follow up

- Periodic medical examination of each member of cohort
- Reviewing records of physician and hospital
- Routine surveillance of death records
- Questionnaire, telephone calls, periodic home visits

Analysis

The data are analysed in terms of

- Incidence rates of outcome among exposed and non-exposed
- Estimation of risk

Risk factor	Cases (disease present)	Controls (disease absent)	Total
Present	a	b	a + b
Absent	c	d	c + d
Total	a + c	b + d	a + b + c + d

Incidence Rate (IR)

$$\text{Incidence rate among exposed} = \frac{a}{a+b} \times 100$$

$$\text{Incidence rate among non-exposed} = \frac{c}{c+d} \times 100$$

Relative Risk (RR)

It tells how much more is the risk among exposed as compared to non-exposed group.

$$\text{Relative risk} = \frac{\text{Incidence rate of disease among exposed}}{\text{Incidence rate of disease among non-exposed}}$$

- A RR of 1 means there is no difference in risk between the two groups.

- A RR of < 1 means the event is less likely to occur in the exposed group than in the non-exposed group.
- e.g. if RR is 0.25 it indicates 75% reduction rates in exposed group than non-exposed, indicating the protective effect of the exposure.
- A RR of > 1 means the event is more likely to occur in the exposed group than in the non-exposed. e.g. if RR is 2, it indicates two times higher risk in exposed than non-exposed individual.
- Larger the RR greater is the risk of association between the disease and exposure.
- RR shows the strength of association but does not imply causal association.

Attributable risk (AR)

$$\text{Attributable risk} = \frac{\text{IR in exposed} - \text{IR in non-exposed}}{\text{IR in exposed}}$$

Attributable risk indicates to what extent the disease under study can be attributed to exposure.

Population attributable risk (PAR)

$$\text{PAR} = \frac{\text{IR in population} - \text{IR in non-exposed}}{\text{IR in population}}$$

PAR plays an important role in prioritising population intervention i.e., it provides an estimate of the amount by which disease could be reduced in that population if the suspected factor was eliminated or modified.

Advantages of cohort study

- 1) Incidence can be calculated
- 2) Several possible outcomes can be studied
- 3) Direct estimate of relative risk
- 4) Dose response ratio can be calculated
- 5) Minimizes misclassification bias

Disadvantages of cohort study

- 1) Large number of people are required
- 2) Not suitable for uncommon disease
- 3) Long time required to complete the study
- 4) Attrition problem (loss to follow up is high)
- 5) Selection bias - volunteers not representative
- 6) Ethical problem due to changes in diagnostic criteria/methods
- 7) Expensive
- 8) Study can alter people's behaviour
- 9) Concentrates on limited number of factors relating to disease outcome

Difference between case control and cohort study

Case control study	Cohort study
Proceeds from effect to cause	Proceeds from cause to effect
Starts with the disease in the study group	Starts with the people exposed to particular cause
Tests whether the suspected cause occurs more frequently with the disease or without the disease	Tests whether the disease occurs more frequently in those exposed than those not exposed
Usually, first approach in testing a hypothesis	Reserved for previously formulated hypothesis
Involves fewer no. of subjects	Large no. of subjects involved
Quick results	Long follow up with delayed results
Suitable for rare diseases	Inappropriate for rare diseases
Yields only Odds Ratio	Yields Relative & Attributable Risk

Yields information about multiple exposure factors associated with the disease	Yields information about more than one outcome to an exposure factor in the study
Relatively inexpensive	Expensive

Relative risk	Odds ratio
Estimate the strength of association in a cohort study	Estimate the strength of association in a case-control study
More accurate	Less accurate
RR= Incidence among exposed/Incidence among non-exposed	Odds ratio = ad/bc