CASE CONTROL STUDY

Objectives:

-How to design a case control study?
-When to use case control study ?
-How to minimize bias in case control study?
-How to establish association between exposure and outcome?

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Resources:

• 436 Lecture Slides + Notes

Important – Notes

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Editing file

Feedback link

Case-Control:

- It is observational analytic epidemiologic investigation
- Subjects are grouped based on their outcome .
- **Are good for long latency period (efficient in time and costs)**
- **Are good for rare diseases**

Aspects to be consider

You have to:

- Guarantee comparability between cases and controls

Selection of controls:

- The controls must be selected to represent not the entire non diseased population(IMP

Strengths

- Relatively quick and inexpensive.
- Well-suited to the evaluation of diseases with long latent periods.
- Optimal for the evaluation of rare diseases.
- Can examine multiple etiologic factors for a single disease.

Limitations

- Insufficient for the evaluation of rare exposures.
- In some situations, the temporal relationship between exposure and disease may be difficult to establish.
- It is particularly prone to bias (selection and recall).

Case-Control:

in case control we want to compare between two group one have the disease and the other dont have the disease and then see the risk factor

•It is observational analytic epidemiologic investigation

•Subjects are grouped based on their outcome (very very important) **while in cohort study they are grouped based on the exposure**

(in cohort study you may asses multiple outcomes with one exposure, while in case control study you may study multiple exposures and their association with one outcome)

•The groups are then compared with respect to the proportion having history of an exposure or characteristic of interest.

(in exam if you see the scenario in talking about the outcome choose case control but if it talk about the exposure choose cohort study),

Case control studies: (is more practical than cohort studies for those reasons)

•Are good for long latency period (efficient in time and costs)

•Are good for rare diseases

•allow for evaluation of a wide range of potential etiologic exposures

•Major problem with this design:

-Both exposure and disease have already occurred at the time the participants enter the study

-bias could also be a major problem

(for example we have two group one with IHD and the other without IHD and the study show that 40 person with IHD smoke and 10 without IHD smoke so the risk to have IHD we you smoke is 4 time than when you did not smoke)

Aspects to be considered:

You have to:

•Guarantee comparability between cases and controls (any subject is not eligible to develop the outcome - to be a case- will not be included as a control)

•Do your best to obtain accurate and complete data

•Have different sources of information (about exposure and disease) and insure the validity of these sources. (اذا مثلا انا ابغى اخذ طول شخص عندي اكثر من طريقة الاولى اني اساله والثانيه اني اخذ رقم ملفه واشوف والثالثة أنا اقوسه)

•Clear definition of the outcome (homogenous disease entity) e.g. congenital malformation (it is a wide terminology it can have a lot of risk in each congenital malformation; the outcome could be very broad) 1-Definite 2-Probable 3-possible

Selection of cases: (depends on the aim of the research)

•Hospital-based case-control study

•Population-based case-control study

Validity should not be compromised in an attempt to achieve generalizability

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Selection of controls:

•The controls must be selected to represent not the entire non diseased population(IMP)

(they should be from the same criteria, for example if i take the case from KKUH i should take the control from the same city not from outside the city, or if i am doing a study on prostate cancer i can't take female controls)

•But they should represent the population of individuals who would have been identified and included as cases had they developed the outcome

- Sources of controls could be:
  - 1-Hospital controls
  - 2-General population controls
  - 3-Special controls such as:
    - •Friends
    - •Neighbors
    - •Relatives

•How many controls per case should be used (1:1 to 4(controls):1(case))

Advantages of using hospitalized controls:

•Easily identified

•Readily available in sufficient numbers

•Reduce recall bias (how?) (because they are more aware of their health condition, they can remember the exposure better than those who haven't developed the outcome)

•Minimizing bias due to nonresponse (how?) (usually they response better than the community)

What is (are) the disadvantages) of having hospitalized controls?

for example if you take the people with IHD as a case and you take the other group people with peptic ulcer as a control group in this scenario there maybe a same risk factor like the smoking it can be the cause of both IHD and peptic ulcer we call these under stimat

Ascertainment of Disease and Exposure Status:

•Any potential source of information must be carefully considered (accurate and comparable for all study groups)

•Possible sources of information:

- Death certificates
- Case registries
- Office records of physicians
- Hospital admission or discharge records
- Log books
- HIS (hospital information system)

Exposure:

- From study subjects - Surrogate - Medical records

- HIS

- It is advised to have the interviewer unaware of the hypothesis, why?
- It is recommended to obtain exposure information from records completed before the occurrence of the outcome, why?

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The role of bias:

•Selection bias:

Can occur whenever the inclusion of cases or controls into the study depends in some way on the exposure of interest.

•Observation bias:

This type of bias may arise because of the prior knowledge of the disease status by the participant or by the investigator.

•Recall bias the most common

Relates to differences in the ways exposure information is remembered by cases and by controls.

•Misclassification: (sometimes it is a result from other bias)

Refers to error in the categorization of either exposure or disease status

Differential vs NonDifferential. (VERY VERY Important)
(differential is when the exposure is misclassified because of the outcome, for example when the researcher knows the hypotheses he could push towards certain classification)
(nondifferential is when it is a random misclassification, **it always leads to underestimation of the point estimated**)

Strength and limitations of case-control study:(Important):

Strengths:

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Limitations:

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- •It is particularly prone to bias (selection and recall).

Extra slide (Tutorial):

Quantification of risk:

Exposure	Disease status	
	Case	Control
Exposed	25 (a)	20 (b)
Not exposed	75 (c)	180 (d)
Total	100 (a+c)	200 (b+d)

Rate of exposure among cases = (a/a+c) x constant
(25/100) X 100 = 25%

Rate of exposure among controls= (b/b+d) x constant
(20/200) X 100 = 10%

Odds ratio (OR) = (axd)/(cxb)
(25x180)/(20x75)= 3.0

Interpretation of odds ratio:

Exposure	Disease status	
	Case	Control
Exposed	25 (a)	20 (b)
Not exposed	75 (c)	180 (d)
Total	100 (a+c)	200 (b+d)

Odds ratio (OR) = (axd)/(cxb)
(25x180)/(20x75)= 3.0

Odds of exposure among cases= $\frac{(a/a+c)}{(c/a+c)} = \frac{a}{c}$

Odds of exposure among controls= $\frac{(b/b+d)}{(d/b+d)} = \frac{b}{d}$

Odds ratio= $\frac{(a/c)}{(b/d)} = \frac{ad}{cb}$

<u>Interpretation of OR:</u>

< 1	Protective
=1	Not related
>1	Risk

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Odds ratio= $\frac{(a/c)}{(b/d)} = \frac{ad}{cb}$

THE END