Level 2
Semester 4

Module
Research

Research design (Analytical research Case control study)

Instructor Name

- **Contact:**
- **email:**
- **Mobile: Academic hours:**
  - **…….day: 00:00-00:00 AM**
  - **……...day: 00:00-00:00 AM**

Contents of the Lecture

- Definition of case control study.
- Steps to conduct case control study.
- Outcome of case control study.
- Advantages of case control study.
- Disadvantages of case control study.

Learning outcomes

At the end of the lecture, the students should be able to:

1. **Understand steps to conduct case control.**
2. **Understand how to calculate and interpret outcomes of cases control study.**
3. **Describe main advantages and disadvantages of case control study.**

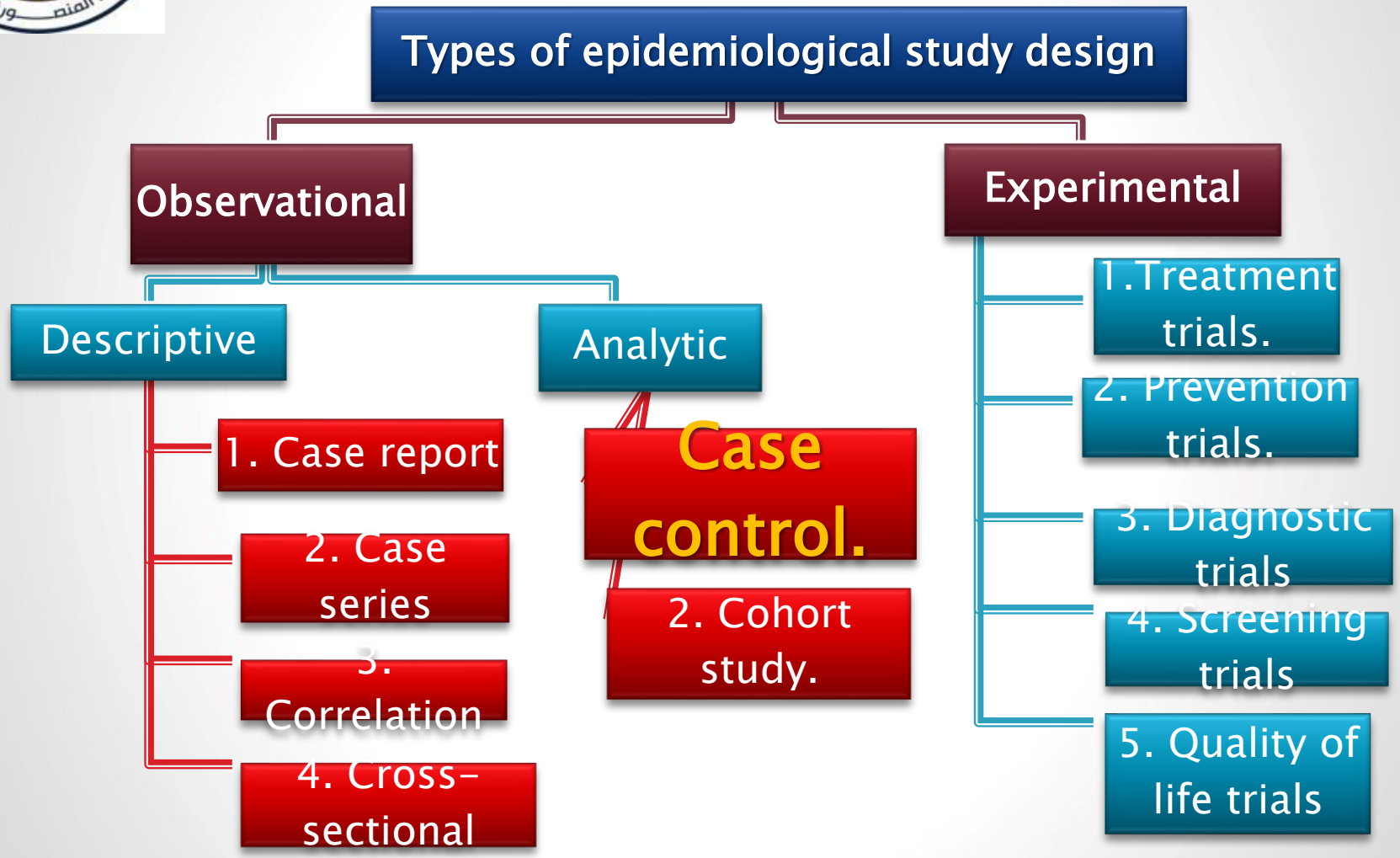
Case scenario or Clinical Correlate

- One hundred patients with cancer tongue were matched for age and sex to one hundred individuals who did not have cancer . Among cases with cancer , 50 cases were smokers , while in those without cancer , 15 only were smokers.
- What is the type of this study?
- .....

  .....
- Calculate two risk measure from this previous data

ILO 1

Understand steps to conduct case control


Types of epidemiological study design
Observational
Experimental
Descriptive
Analytic
1. Case report
2. Case series
3. Correlation
4. Cross-sectional
Case control.
2. Cohort study.
1.Treatment trials.
2. Prevention trials.
3. Diagnostic trials
4. Screening trials
5. Quality of life trials

Reference:

ILO1

Analytical Studies

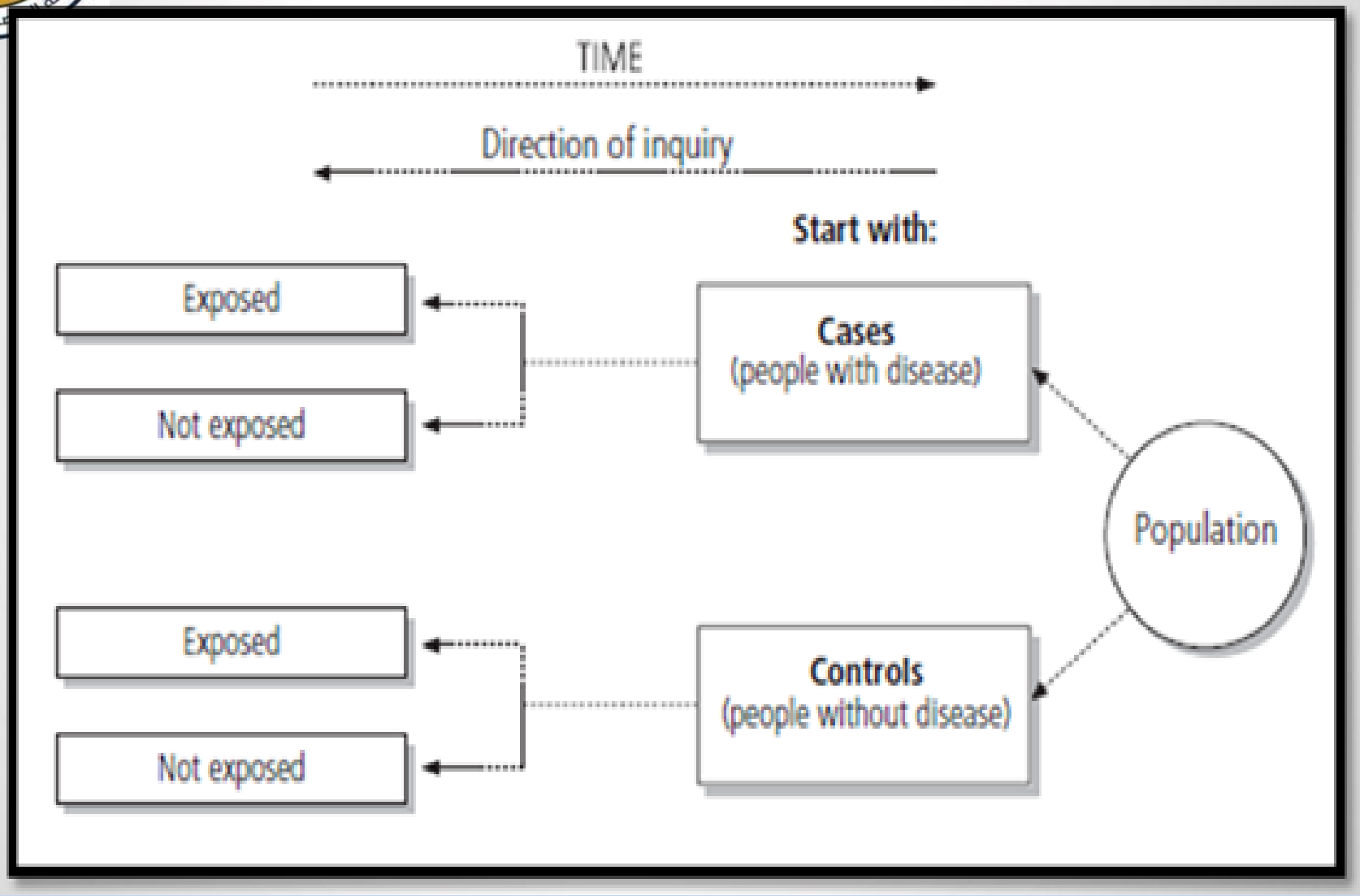
- Exposure  Outcome (disease).
- These studies are used to test an etiologic hypothesis such as smoking and Lung cancer; excess carbohydrates and obesity
- Analytical studies always require the use of control group.

Definition

Study

- It is an "observational" in which we assess the frequency of exposure to specific risk factor (suspected etiological factors) in patients who have developed a disease
- It is compared with that of controls who do not have the disease

بنقارن تكرار حدوث التعرض لل**risk factor** اللي احنا شاكين انه بيسبب المشكلة
(بنقارن بين ال**cases** (المصابين) والغير مصابين اللي هما **controls**)


TIME
Direction of inquiry
Start with:
Exposed
Not exposed
Cases
(people with disease)
Population
Exposed
Not exposed
Controls
(people without disease)

Reference:

- Case-control studies provide a relatively simple way to investigate **causes of diseases**, especially rare diseases

- The investigator is looking backward from the disease to a possible cause **(retrospectively)** by direct questioning and or extracted from clinical records

Steps to conduct a case control study:

- Identify the study group (cases)

العيان اللي هندرس حالتن

- Define criteria for diagnosis and the criteria for inclusion and exclusion of cases

المواصفات اللي هناخدها معانا (inclusion criteria)واللي مش هناخذها معانا (exclusion)
ولازم يتم كتابتهم بشكل واضح في البحث

- 2. Identify controls: (needed for comparison)

اللي هيدخلوا معانا ومش هيكونوا cases
احسن نسبة بينهم تكون حالة case مقابل أربعة control
وعلى الاقل واحد مقابل واحد

- –Controls must be free from the studied disease.

Sources of control

- 1. General population
- 2. Hospital controls
- 3.Special control series (Family members- friends- neighbors)

ILO2

Understand how to calculate and interpret outcomes of cases control study.

Data are summarized in 2x2 table:

Exposure	Disease status		Total
	Cases	Controls	
Yes (+)	(a) Diseased with exposure	(b) Not diseased with exposure	(a+b) Total exposed
No (–)	(c) Diseased without exposure	(d) Not diseased without exposure	(c+d) Total non-exposed
Total	(a+c) Total cases	(b+d) Total control	(a+b+c+d) Grand total

The calculated measures are:

عادي جدا ان احنا يتطلب مننا الproportion of non exposed
في حالة الcases هتبقى c/(a+c)
وفي حالة الcontrol هتبقى d/(b+d)

P_1 proportion of the exposed among cases

a / (a+c) = P1

$$P_1 = a/a + c$$

P_2 proportion of the exposed among controls

b/ (b+d) = P2

$$P_2 = b/b + d$$

Relative contribution = $P_1 - P_2$

It represents relative contribution of the suspected cause to the total frequency of the disease

فرضنا انه نسبة الexposed في المصابين هي ٦٥٪ ونسبة الexposed في اللي مش مصابين ٣٠٪
فده معناه انه الrelative contribution هتساوي ٣٥٪ وده معناه انه الexposure
ساهم في ٣٥٪ من إصابة حالات المرض (ال٦٥٪ في الحالة دي هتكون تبع عوامل تانية)

Odds ratio (OR) نسبة الأرجحية

Odd of exposure to risk factor among cases (R_1) = a/c

Odd of exposure to risk factor among controls (R_2) = b/d

Odds ratio = R_1/R_2 = a/c / b/d = ad/bc

الأهمية بتاعت الodds rario

It is the indirect estimation of the risk

بنقسم الexposed في الdiseased على الnon exposed في الdiseased عشان نسبة التعرض للrisk factor بين ال
ونفس الحاجة مع الcontrols عشان نعرف نسبة التعرض للrisk factor بين الcontrols
وفي الآخر نقسم الرقم الاول (بتاع الcases) على الرقم التاني

Interpretation of odds ratio

لو odds ratioيساوي واحد، يبقى مفيش بين الexposure والdisease اي علاقة
لو الرقم اعلى من واحد يبقى الexposure بيزود الحالات
ولو الرقم اقل من واحد يبقى الexposure بيقلل الحالات

OR = 1	OR > 1	OR < 1
• Exposure is not associated with outcome or disease	• . Increased exposure accompanies increased outcome	• Increased exposure accompanies decreased outcome

Answer

- $P_1 = a/a + c = 32/36 \times 100 = 88.9\%$
- $P_2 = b/b + d = 16/64 \times 100 = 25\%$
- Relative contribution $= P_1 - P_2 = 63.9\%$
- It represents relative contribution of excess carbohydrate consumption to the total frequency of dental caries among cases..

لما تيجي تكتبها في الامتحان اكتب الجملة وزود عليها رقم الrelative contribution

ILO 3

Describe main advantages and disadvantages of case control study.

Advantages of case control study

1. Easy to conduct.
2. Quick and cheap.
3. Allows the study of several risk factors.
4. Useful in the study of disease with a long latency.
5. Can be used in rare diseases.
6. Does not require large samples.
7. Can prove hypothesis (Exposure & Disease are related).
8. Can estimate risk (odds ratio).

Disadvantages of case control study

1. Cannot calculate rates.
2. Not useful in rare exposure.
3. Liable to bias.

Questions
(At least 5 questions with answers and explanations)

Q1 Enumerate basic steps of CCS?

Q2 Describe source of control in CCS?

Q3 Mention main outcomes of CCS?

Q4 Outline main advantages of CCS?

Q5 Outline main disadvantages of CCS?

Summary and wrap up

- Definition of case control study.
- Steps to conduct case control study.
- Outcome of case control study.
- Advantages of case control study.
- Disadvantages of case control study.

Reference:

Answers

- **Q1 It is an “observational” design comparing exposures in disease cases versus healthy controls from same population - Exposure data collected retrospectively - It is the most feasible design where disease outcomes are rare.**

- **Q2 Sources of controls:**
- **1. General population**
- **2. Hospital controls.**
- **3. Others (Friends, neighbors, fellow employees or peers, family members).**

- **Q3**

Proportion of the exposed among cases (P1)= a/a + c

Proportion of the exposed among control (P2) = b/b + d

Odds Ratio = odd of exposure among cases / odd of exposure among controls

Odds Ratio = a/c / b/d = ad/bc

Q4 Advantages of case control studies:

- **1. Easy to carry out.**
- **2. Quick & cheap.**
- **3. Useful in early stages of the development of knowledge.**
- **4. Can be used in rare diseases.**
- **5. Allows the study of several risk factors.**
- **6. Useful in the study of disease with a long latency.**
- **7. Does not require large samples.**
- **8. Can prove hypothesis (Exposure & Disease are related).**
- **9. Can estimate risk (odds ratio).**

Reference:

Q5Disadvantages of Case Control Study:

1. Cannot calculate prevalence or incidence rates.
2. Not useful in rare exposure.
3. Liable to bias or mistakes

Discussion

10 minutes

Brain storming question or another related case scenario

- Fifty persons diagnosed with obesity and another fifty without obesity were asked if they consume excess chocolates. From the first group 20 persons confirmed chocolate consumption whiles they were 5 in the second group.
- What is the type of this study?
- ……
  ……
- Calculate two risk measure from this previous data

Reference: https://www.genpharmservices.com/aspire-educational-series-mitochondrial-myopathy-mm-part-13/

Feed back

References