

سُبْحَانَ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



L XIX



Epidemiological and Research Studies

Part 2

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Analytical studies

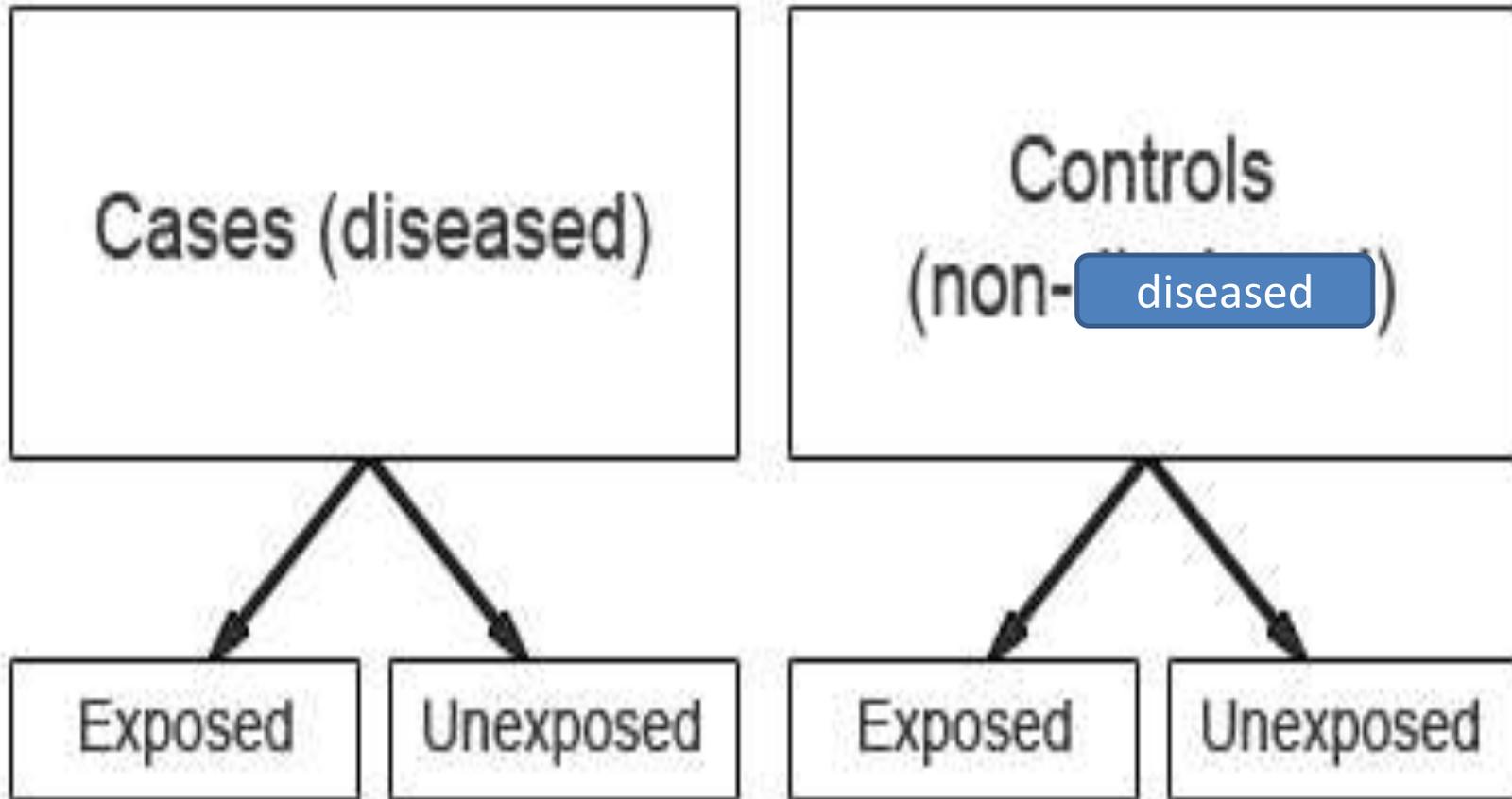
1. Cross-sectional
2. Case-control
3. Cohort

Case control Study

Issues in the design of case-control studies

- Formulation of a clearly defined hypothesis
- Selection of cases
- Selection of controls
- Measuring exposure status

- basic concepts,
- application and strengths of CCS
- Issues in the design CCS
- Common sources of bias in a CCS
- Analysis of CCS
- Strengths and weaknesses of CCS



Case-control studies are one of the frequently used study designs **due to the relative ease of its application in comparison with other** study designs

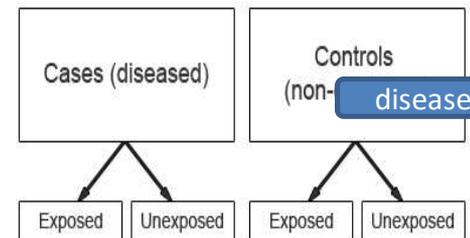
case-control studies (CCS)

❑ start with the identification of

❖ **a group of cases** (individuals with a particular health outcome) in a **given population**

❖ **a group of controls** (individuals **without** the health outcome) to be included in the study.

❖ Then for each **case** and **control** it is determined whether they have been exposed to the factor under study or not.



❑ In CCS the **prevalence of exposure** to a potential risk factor(s) is

❖ compared between **cases** and **controls**.

➤ If the **prevalence of exposure** is

✓ more common among **cases** than **controls**,

✓ it may be a risk factor for the outcome under investigation.

❑ **A major** characteristic of CCS is

➤ that data on potential **risk factors** are

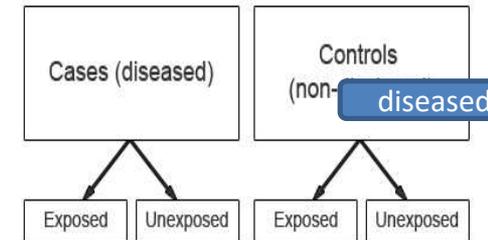
➤ **collected retrospectively** and

✓ as a result may give **rise to bias**.

This is a **particular problem** associated with case-control studies and

➤ therefore needs to be carefully considered during the

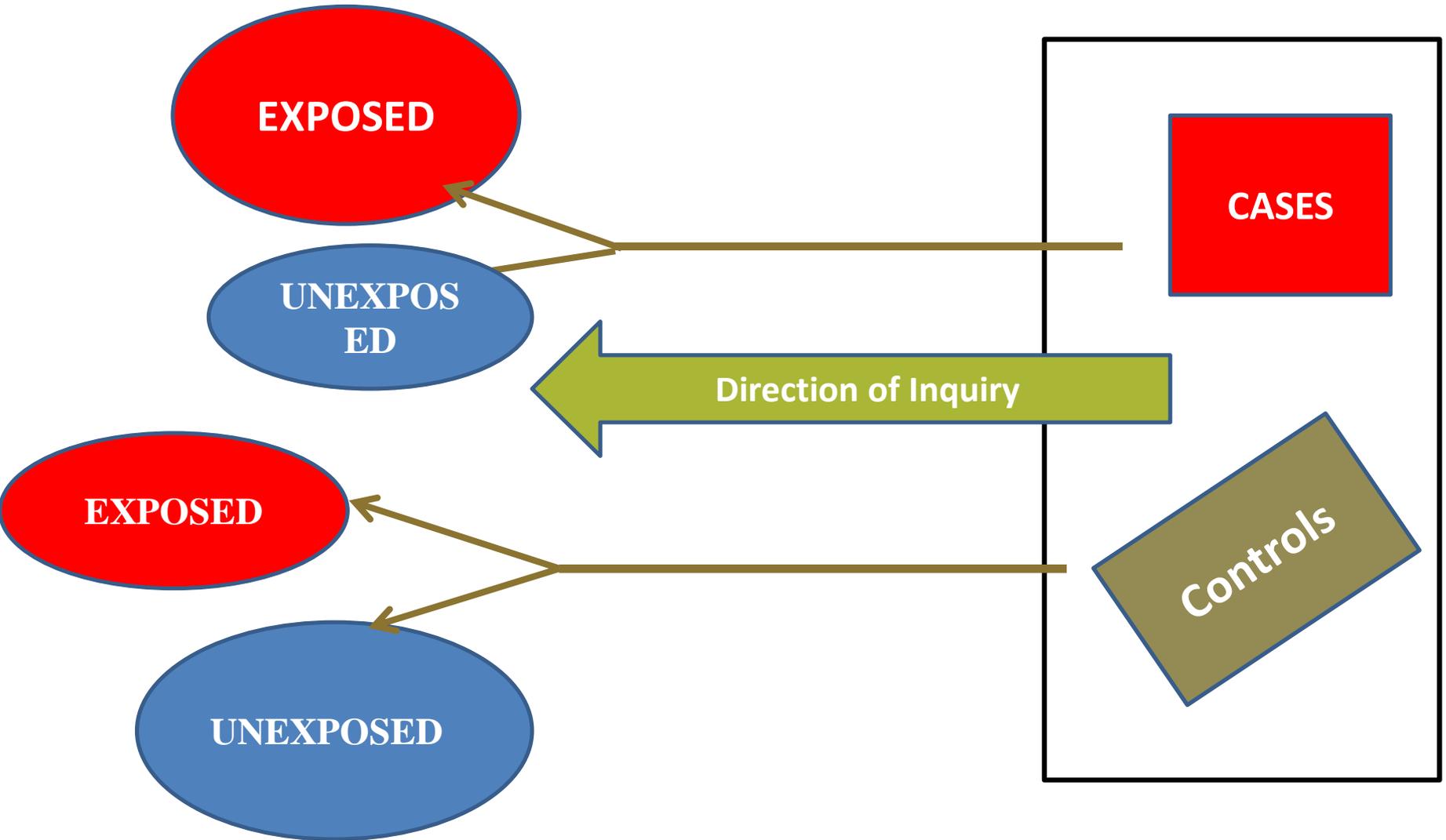
➤ design and conduct of the study



- ❑ **Case definition** is **clearly defined** at
 - **all cases included in the study are based on the same diagnostic criteria**
- ❑ **Source of cases**
 - ❖ The **source of** cases and control needs to be **clearly defined**
 - ❖ **Recruiting more than one control per case may improve the statistical** power of the study,
 - ❖ though including more than 4 controls per case is generally considered to be no more efficient.
- **CCSs** have been called **retrospective** studies **since the investigator is looking backward** from the disease to a **possible cause**.
 - ❖ Case-control studies provide a **relatively simple way to investigate causes of diseases**, especially **rare diseases**



Design of a Case-Control study



Hepatitis C Virus Prevalence and Genotyping among Hepatocellular Carcinoma Patients in Baghdad

Waqar Abd Al Qahar Al-Kubaisy, Kadhim Jawad Obaid, Nor Aini Mohd Noor, Nik Shamsidah Binti Nik Ibrahim, Ahmed Albu-Kareem Al-Azawi

Hepatocellular carcinoma (HCC) is the third most common cause for cancer death in the world, now being especially linked to chronic hepatitis C virus (HCV) infection. This **case-control study consisting of 65 HCC patients and 82 patients with other malignant tumours as controls** was conducted to **determine the association of HCV markers with HCC**. Serum of each participant was obtained for detection of HCV Ab and RNA by DNA enzyme immunoassay (DEIA). Twenty six per cent (26.0%) of HCC patients had positive anti-HCV which was significantly greater than the control group ($p=0.001$). **HCC patients significantly have a risk of exposure to HCV infection almost 3 times** than the control group (**OR=2.87, 95% C.I=1.1-7**). Anti-HCV seropositive rate was significantly ($p=0.03$) higher among old age HCC patients and increases with age. Males with HCC significantly showed to have more than 9 times risk of exposure to HCV infection (**OR=9.375, 95 % CI=1.299-67.647**) than females. HCV-RNA seropositive rate was (70.8%) significantly higher among HCC patients compared to (22.2%) the control group ($p=0.019$). The most prevalent genotype (as a single or mixed pattern of infection) was HCV1b. This study detected a significantly higher HCV seropositive rate of antibodies and RNA in HCC patients.

The case group consisted of 65 patients, histologically confirmed with HCC and a serum level of alpha-fetoprotein exceeding 400ng/ ml, while 82 patients with other malignant tumours (not related to gastro intestinal system) were considered as a control group. Four hospitals namely Baghdad Teaching Hospital-Baghdad Medical City, Al Kadhmiya Teaching Hospital, Radiology and Nuclear Medicine Institute and Al Yarmuk General Teaching Hospital **were chosen for** data collection. **Only respondents with informed consent were interviewed** using a structured questionnaire and serum samples were taken for HCV markers analysis. **Patients with positive serum HBV were excluded** from this study. Serum sample of each participant was dispensed

□ Measuring exposure status

- ❖ Exposure status is measured **to assess**
 - **the presence** or **level of exposure** for each individual **for**
 - **the period of time prior to the onset of the disease** or condition under investigation when the exposure would
 - **have acted as a causal factor.**
- ❖ Note **that in CCS** the **measurement** of **exposure is established after the development of disease** and as a result is **prone to both recall and observer bias.**

- **The procedures used for the collection of exposure data**
- **should be the same for cases and controls.**

3. Analysis of case-control studies

Example:

A case-control study was conducted to test the association between smoking and cancer of the pancreas of the 100 cases 60 of them were smokers, while of the 400 controls, 100 were smokers. Calculation of the OR from

$$OR = \frac{a/c}{b/d} = \frac{ad}{bc}$$

Table 1. Hypothetical CCS of smoking and ca pancreas

Exposure	Cases	Control	Total
Smokers	60 (a)	100 (b)	160
Non Smokers	40 (c)	300 (d)	340
Total	100	400	500

$$OR = \frac{60 \times 300}{100 \times 40}$$
$$OR = 4.5$$

The OR estimates that ,smokers are **4.5 times** more likely to develop cancer of the pancreas than non-smokers.

NB: The odds ratio of smoking and cancer of the pancreas has been performed without **adjusting for potential confounders**.

4. Strengths and weaknesses of CCS

basic concepts,
application and
strengths of CCS
Issues in the design CCS
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Strengths

- ✓ **Cost effective** relative to other analytical studies such as cohort studies.
- ✓ CCS are retrospective, and cases are identified at the beginning of the study; therefore **there is no long follow up** period (as compared to cohort studies)
 - **Efficient** for the study of **diseases with long latency periods.**
- ✓ **Efficient** for the study of **rare diseases**
- ✓ Good for examining **multiple exposures.**

Weaknesses

- Particularly **prone to bias**; especially **selection, recall and observer bias.**
- CCS limited to **examining one outcome.**
- **Unable to estimate incidence rates** of disease
- **Poor** choice for the study of **rare exposures.**
- **The temporal sequence** between exposure and disease may be **difficult to determine.**

Thank you for attention

year 1st medical
students



Cohort Study

Issues in the design of cohort studies understand the differences from a CCS,

- *Potential bias in cohort studies
- *Analysis of cohort studies
- *calculate the basic measures (RR,AR
- *appreciate its strengths and weaknesses.