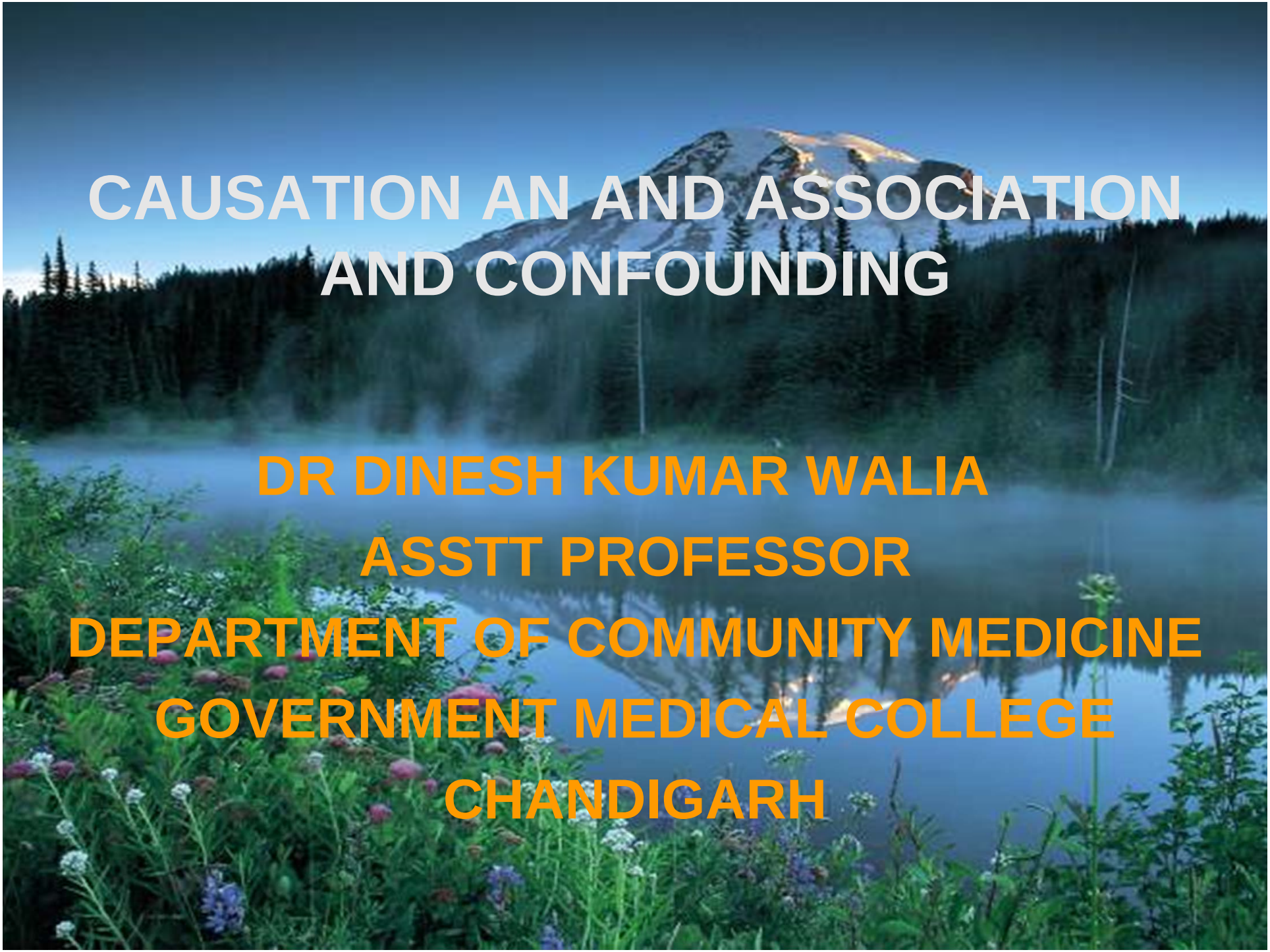

CAUSATION AN AND ASSOCIATION AND CONFOUNDING

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Terminology

Risk ??

Risk Factor: Characteristic, condition or behaviour increasing the problem of developing a disease in a currently healthy individual.

i.e P (D+ / E+) > P (D+ / E-)

eg. for lung cancer: Smoking.

Risk Factor: env. / behavioural / social / psycho / genetic etc. exposure to risk factor may be point / chronic.

Risk Assessment: Quantification / Extent of association / risk amount.

Risk Markers: Factors indirectly associated with the outcome.

eg. Neonatal Mortality:

Risk factors	:	Poor pre-natal care, ……
Casual factors	:	LBW ……
Marker	:	Low SES
Synergy	:	LBW & other complications.

Characteristics of Casual Factors:

- Consistency
- Strength
- Specificity
- Temporality
- Coherence

RISK FACTOR Vs CASUAL FACTOR

Casual Factor ≡ A risk factor which causes disease

Risk factor ≠ casual factor (may be vice versa)

Why? The observed association between risk factor & disease may also be due to confounders / markers and synergistic factors.

Confounders?? Synergistic Factors? Markers??

CONFOUNDING FACTORS

- Factor associated with exposure which independently of any such association is also risk factor for the disease.
- Factors distorting association between risk factor & disease by creating artificial relationships. A confounder is associated with both expo. and outcome, but unequally.

To eliminate the effect of confounding.

- Matching

To ensure comparability of cases and controls.

(a) Pair matching

(b) Group matching

- Stratification

Suspected etiologic factors should not be used as potential confounders for

matching factors.

Examples of Confounding Factors

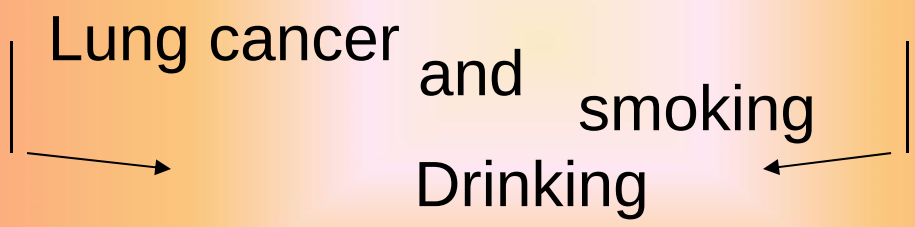
(1) Smoking & Lung cancer (age is confounder)

(2) Contra use (IUD) - Cervical cancer
(age & marital status)

(3) OC - BC (age)

Synergistic Factors: Synergy means magnification of effects arising from different exposures / risk factors s.t. effect of exposures working together is greater than the sum of their individual effects. ie. P (AB) > P (A) + P (B).

eg. (1)



R [Smoke & Drink] > R (Smoke) + R (Drink)

(2)

Difference between confounding and synergy:

- In synergy, we are interested in joint effect or effect modification. A effect modifier (syn. Factor) relates essentially to differences between the measures of associate at different levels of modifier.
- In confounding, crude measure of associated does not reflect in each category necessarily, but the association is consistent.

ASSOCIATION AND CAUSATION

Types of Association:

- Spurious / unreal
- Indirect
- Direct / casual

Types of Causation

- One – to – One
- Multi-factorial

Criterion for judging Causality of Association

- Temporality

  Whether suspected cause precede the observed effect.
- Strength of association

  (RR or dose-response or duration response relationship)
- Specificity (One-One association, but a single cause may result in several outcomes)?
- Consistency
- Biological plausibility
- Coherence

Risk: Prob. / Prop. Of individuals suffering from particular disease out of total individuals.

$$\text{Risk: } P(D+) = \frac{\text{No. of diseased individuals}}{\text{Total no. of individuals}}$$

in cross sec. study, Risk = Prev. rate

Note: In case of cohort study (fixed follow-up)

Risk ≡ IR

$$= \frac{\text{No. of persons developing diseases during follow-up}}{\text{No. of persons disease free at start of study}}$$

Probability and odds

- Probability
- Odds =No of times the event occurs/ No of times the event doesn't occur

=Probability that the event will occur divided by the Probability that the event will not occur.

$$= \frac{P \text{ (Occurrence of event)}}{P \text{ (No. occurrence of the event)}}$$

Odds of an event (say disease) is defined as the ratio:

$$\equiv \frac{P(D+)}{P(D-)} \quad \text{or} \quad \frac{P(D+)}{1 - P(D+)}$$

$$= \frac{a/N}{b/N} = \frac{a}{b} = \frac{\text{No. of occurrences}}{\text{No. of non-occurrence}}$$

- Probability can be expressed as odds and odds can be expressed as probability.
- Odds = probability/1-probability= P/1-P
- P = odds/1 + odds

Odds Ratio (OR) or Relative Odds (RO):

OR is used to compare absolute risks in two categories may be E+ and E- or D+ and D-

$$OR = \frac{\text{(Odds) expo}}{\text{(Odds) unexpo}}$$

In case of low risk / rare disease, OR gives an excellent approximation of relative risk (RR).

$$OR \approx \hat{RR} \equiv \text{Estimated RR}$$

Relative Risk:

$$RR = \frac{\text{Risk among expo}}{\text{Risk among unexpo}}$$

In Cross-sectional study:

$$IR = \frac{\text{PR among expo}}{\text{PR among unexpo}}$$

In Cohort Study:

$$\equiv \frac{\text{(IR) expo}}{\text{(IR) unexpo}}$$

ATTRIBUTABLE RISK (AR)

Prop of diseased individuals attributable to a particular expo variable ie The amount of risk which can be attributed to a particular risk factor:

$$AR(1) = \frac{P(D+/E+) - P(D+/E-)}{P(D+/E+)}$$

$$= \frac{(IR)\ \text{expo} - (IR)\ \text{unexpo}}{(IR)}$$

(for follow-up studies)

$$= \frac{I - I}{RR} = \frac{RR - I}{RR}$$

$$AR(2) = P(E+/D+).\ AR(I)$$

$$= (\text{Expo rate among diseased}).\ AR(I)$$

$$AR(3) = \frac{P(D+) - P(D+ / E-)}{P(D+)}$$

$$= \frac{I - P(D+ / E-)}{P(D+)}$$

where $P(D+)$ = Disease rate in the population ie PR.

Another form:

$$AR(3) = \frac{P(E+)(RR-I)}{I + P(E+)(RR - I)}$$

- AR guides us in management of individual patients.
- AR gives the amount of risk that can be attributed to expo to a particular risk factor.

eg. Epilepsy & Delivery type

AR gives us the risk of epilepsy developing as a consequence of forceps delivery.

- Other syno terms of AR:

Risk difference = P(D+/E+) – P(D+/E-)

= (Risk) expo – (Risk) unexpo.

≡ Excess Risk ≡ Rate Difference give crude expressions of AR.

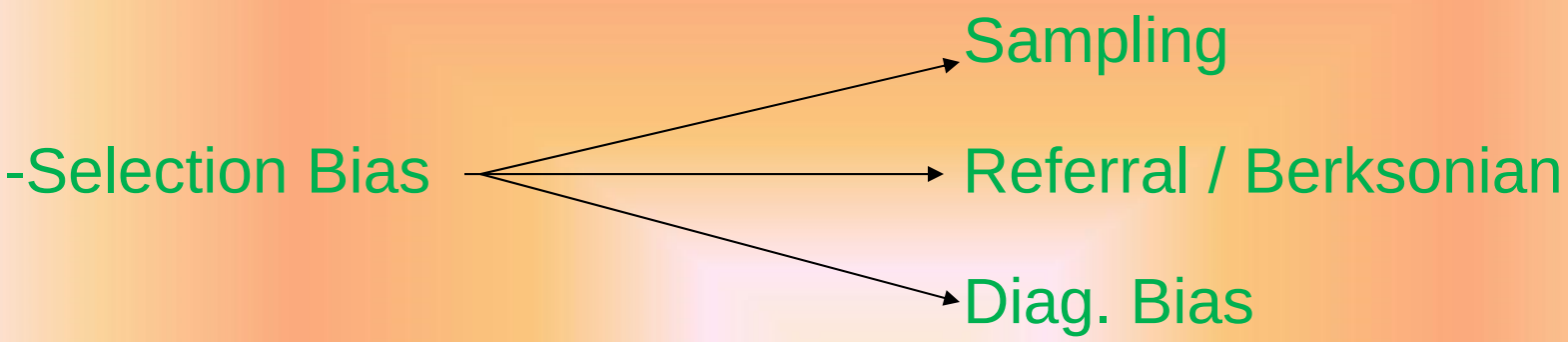
POPULATION ATTRIBUTABLE RISK (PAR)

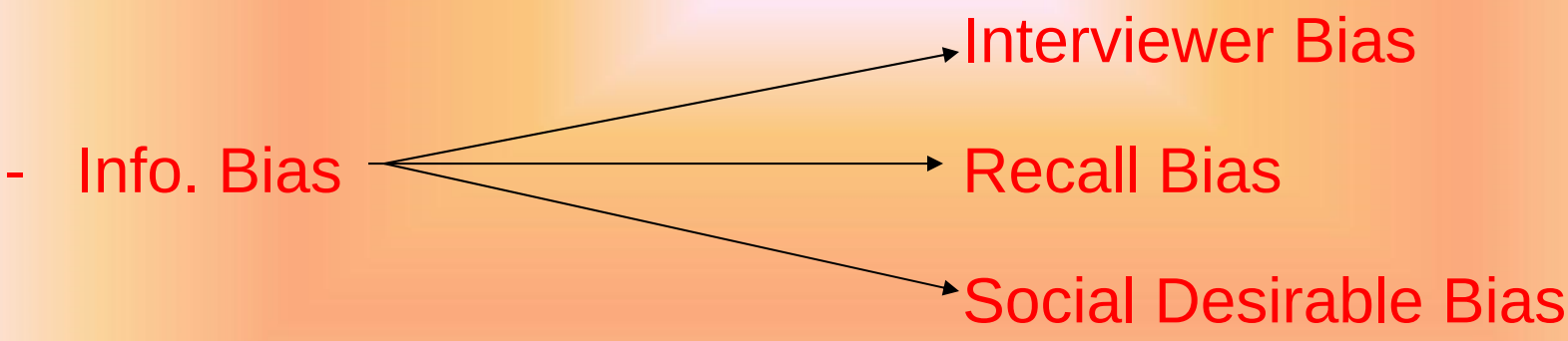
PAR is a measure of excess amount of risk of a particular disease in the population that can be solely attributed to the risk factor.

PAR = AR P(E+) (in population)

If an independent estimate P (E^+) ie proportion of people exposed in the population is available, then PAR can be obtained.

TYPES OF BIASES / ERRORS IN EPIDEMIOLOGICAL STUDIES






THANK YOU