CONCEPT OF HEALTH & DISEASE

1873 → Louis Pasteur introduced the germ theory of disease.

SDG

On sept. 2015, United Nations General Assembly adopted new dept agenda:

Transforming our world: the 2030 agenda for sustainable dept.

→ 17 SDG.

- Integrate economic, social & environmental dimensions of sustainable development.
- Themes of people, planet, prosperity, peace & partnership.
- SDG recognize that eradicating poverty, & inequality, creating economic growth & preserving the planet are linked to each other & pop^n health.

SDG 3 → Ensure healthy lives & promote well being for all at all ages

→ 13 targets

- → 4 to unfinished Millenium DG
- → 4 to address NCD, mental H, injuries, envt issues
- → H means of implementation
- → universal health coverage

Goals:

1. No poverty.
2. Zero hunger.
3. Good health and well-being
4. Quality education
5. Gender equality.
6. clean water and sanitation
7. Affordable & clean energy
8. Decent work and economic growth.
9. Industry, innovation & infrastructure
10. Reduced inequalities
11. Sustainable cities & communities
12. Responsible consumption and production
13. Climate action
14. life below water
15. life on land
16. peace & justice
17. partnerships for the goals.

Health → state of complete physical, mental & social well being & not merely an absence of disease or infirmity

Dimensions of Health:

1. Physical dimension
   - → perfect functioning of body
2. Mental dimension
   - → state of balance b/w individual and surrounding world, state of harmony b/w oneself and others, understanding b/w realities of self & others people & how to enhance
3. Social dimension

- harmony & integration within individual, b/w each individual & other members of the society & b/w individuals and the world in which they live.

4. Spiritual dimension.
5. Emotional dimension. "feeling".
6. Vocational dimension 'work'
7. Others
   - philosophical dimension.
   - cultural
   - socio-economic
   - environmental
   - educational
   - nutritional
   - curative
   - preventive

- positive health: implies the notion of "perfect functioning" of the body & mind
  - biologically - state in which every cell & every organ is functioning at optimum capacity and in perfect harmony with the rest of the body
  - psychologically - individual feels a sense of perfect well-being and of mastery over his environment.
  - socially - individual's capacities for participation in the social system are optimal.

- Physical quality of life index (PQLI)

  ~~consc~~ Quality of life can be evaluated by a composite index PQLI which consolidates 3 indicators:
  - infant mortality rate.
  - life expectancy at age 1.
  - literacy

  for each component performance of individual countries placed on a scale of 0-100.

  → measures the result of social, economic & political policies.

  ~~HPI~~ $\frac{A+B+C}{3}$

  → ultimate objective is to attain PQLI of 100

- Human Development Index (HDI)

  a composite index focusing on 3 basic dimensions of human development:
  - life expectancy at birth.
  - mean years of schooling & expected years of schooling
  - gross national income per capita

  (long life, being knowledgeable & decent std. of living)

  - value range b/w 0 & 1. → max.

- developed countries
  → HDI ≥ 0.8
  least developed ≤ 0.55

- Dimension index (step 1).
  = $\frac{\text{Actual value} - \text{Min value}}{\text{Max. val} - \text{Min val.}}$

Step 2 : HDI is the geometric mean of the 3 dimension index.

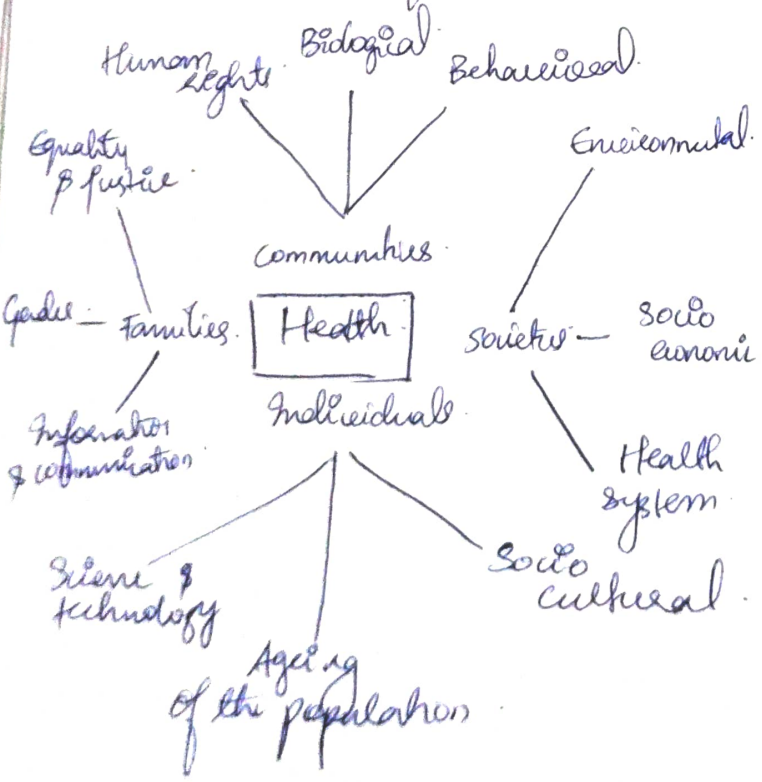
$$HDI = \left(I_{life}^{1/3} \times I_{education}^{1/3} \times I_{income}^{1/3} \right)$$

- **Spectrum of health**

health is a dynamic phenomenon and a process of continuous change subjected to frequent subtle variations.

positive health Better health Freedom from sickness	Unrecognised sickness Mild sickness Severe sickness Death

- **Determinants of health**



1. Biological → genes, d/s
2. Behavioural & sociocultural cond:
   → lifestyle, social values, attitude
3. Envt — Internal
   ↘ External
4. Socioeconomic cond:
   → economic status
   → education
   → occupation
   → political system
5. Health services
6. Ageing of the pop^n
7. Gender
8. Other factors

- **Health development** – process of continuous progressive improvement of health status of a pop^n
  – red^n of d/s, +ve physical & mental H, satisfactory economic functioning and social integration

- **Indicators of Health**

1. Mortality indicators
2. Morbidity indicators
3. Disability rate
4. Nutritional status indicators
5. Healthcare delivery indicators
6. Utilization rate
7. Indicators of social & mental health
8. Environmental indicators
9. Socio-economic indicators
10. Health policy indicators
11. Indicators of quality of life
12. Other indicators

I. Mortality Indicators :

(a) Crude death rate
– No of deaths per 1000 people per year in a community

(b) Expectancy of life
– avg no of years that will be lived

by those born if current age specific mortality prevails

(c) Age specific death rates

(d) Infant mortality rate
$$\frac{\text{deaths under 1 yr (in a yr)}}{\text{total no. live births that yr}}$$

(e) Child death rate (1-4 yrs)

(f) Under 5 proportionate mortality rate

(g) Adult mortality rate

(h) Maternal mortality rate

(i) Disease - specific mortality rate

(j) proportional mortality rate

(k) case fatality rate

(l) Years of potential life lost

Morbidity Indicators:

→ Incidence & prevalence

→ notification rates

→ attendance rates at OPD, Health centre etc

→ admission, readmission and discharge rates

→ duration of stay in hospital

→ spells of sickness or absence from work or school

Disability rates:

(a) Event type Indicators

(i) No. of days of restricted activity

(ii) Bed disability days

(iii) Work loss days within a specified

(b) Person type Indicators

(i) Limitation of mobility

(ii) Limitation of activity

- Health-Adjusted life Expectancy (HALE)
  no. of yrs in full health that a newborn can expect to live based on current rates of ill health and mortality

- Quality Adjusted life years (QALY)
  - measure of disease burden including quality & quantity of life lived
  - no. of years of life that would be added by medical intervention

- Disability free life expectancy
  (if current pattern of mortality & disability continue to apply)

- Disability adjusted Life Years (DALY)
  - measure of overall disease burden
  - No. of years lost due to ill-health, disability or early death

$$DALY = YLL + YLD$$
YLL → years of life lost
YLD → years lost due to disability

Nutritional Status indicators
- anthropometry
- LBW prevalence
- Ht & wt of children

Health care delivery Indicators
→ Doctor - pop^n ratio
→ Nurse - nurse ratio
→ Pop^n - bed ratio, subcentre
→ Pop^n per health
→ Pop^n per trained birth attendant

Utilization rate

→ proportion of fully immunized infants
→ propn of preg. W who received ANC
→ % of pop" using family plng
→ Bed occupancy rate
→ Avg length of stay
→ Bed turnover rate

Indicators of Social & Mental health

- Indicators of social & moral pathology
  ↳ suicide, homicide, crime, RTA, JD, alcohol & Dabue

Socioeconomic Indicators

→ Rate of pop" ↑
→ per capital GNP
→ Level of unemployment
→ dependency ratio
→ literacy rate
→ family size
→ Poverty
→ per capita calorie availability

• **Health gap** : There is a wide health gap between pop" in the developed and developing countries

→ "epidemiological transition"
burden of disease pattern in these 2 countries differ substantially
NCD & CD

Health System

↳ the human & material resource that a nation or community deploys to promote, protect and restore health and to minimize suffering caused by disease, injury and corresponding administrative and organizational arrangements

Levels :

(i) PHC
- 1st level
- essential healthcare
- closest to people
- PHCs & Subcentres

(ii) SHC
- more complex peoples
- tertiary services
- 1st referral level
- District hospitals etc

(iii) Tertiary healthcare
- superspecialist care
- planning, managerial skills & teaching for special staff
- regional / central level institution

Primary Healthcare

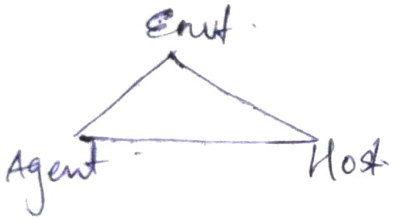
- concept introduced in 1978 after conference in Alma Ata.

" Essential healthcare based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community & country can afford to maintain at every stage of their development in the spirit of self-determination

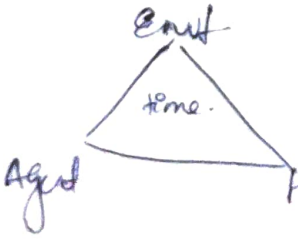
Declaration of Alma-Ata stated that primary healthcare should include:

- education about prevailing health problems, their prevention and control
- adequate supply of safe water and basic sanitation
- maternal & child healthcare
- Immunisation
- prevention & C of endemic d/s
- appropriate t/x of common d/s & injuries
- provision of essential drugs.

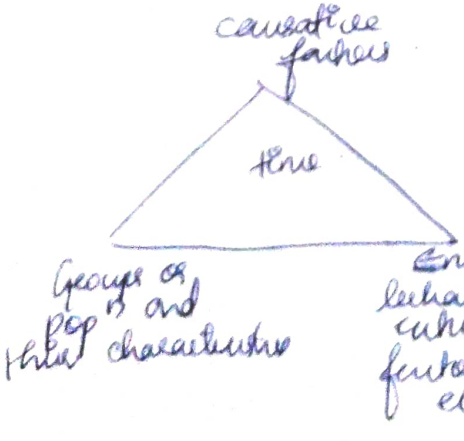
→ Epidemiological triad.



→ Tetrangle of epidemiology

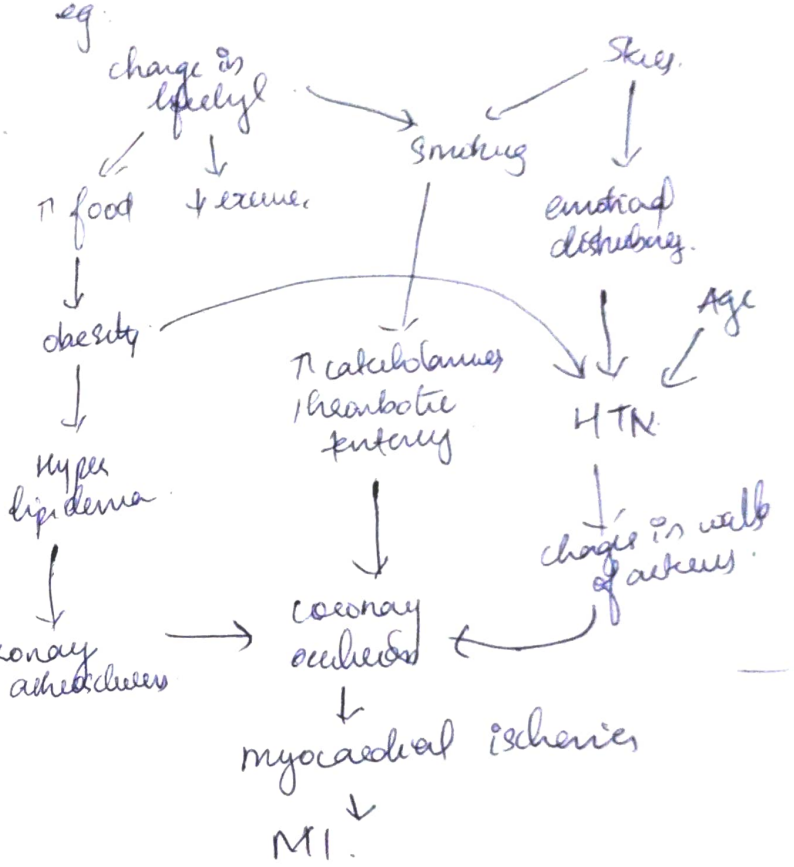


→ Advanced model of triangle of epidemiology.



Web of causation.

- suggested by MacMahon and Pugh
- in the study of c/c disease
→ considers all predisposing factors of any type and their complex relationship with each other.

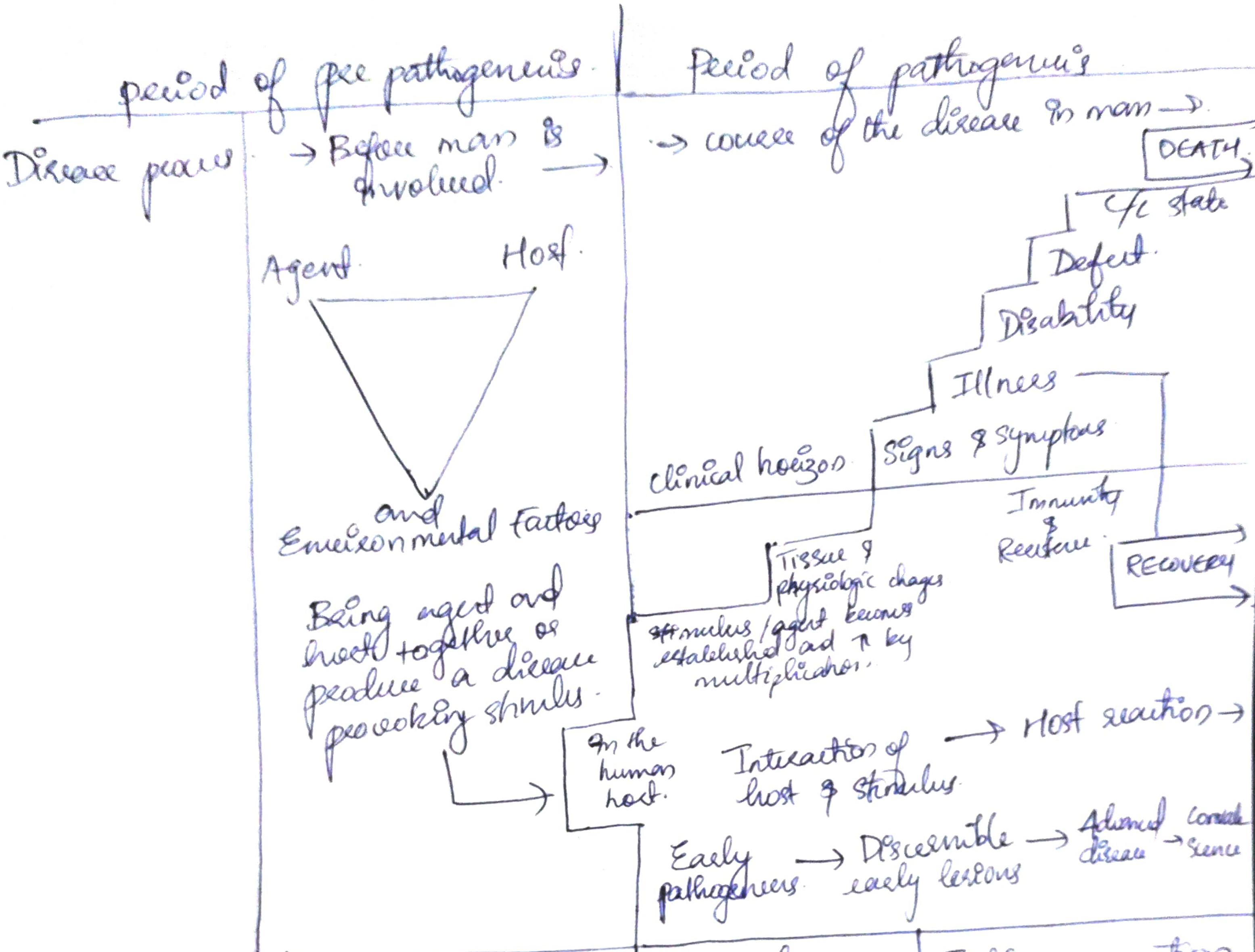


Natural history of Disease.

→ Disease results from a complex interaction between man, an agent and the envt.

- Signifies the way in which a disease evolves over time from earliest stage of its pre-pathogenic phase to its termination as recovery, disability or death in absence of t/x or prevention

→ best established by cohort studies


Period of pre pathogenesis
Period of pathogenesis
Disease process
→ Before man is involved →
→ course of the disease in man →
DEATH
C/C state
Defect
Disability
Illness
Signs & symptoms
Clinical horizon
Immunity & Resistance
RECOVERY
Tissue & physiologic changes
stimulus / agent becomes established and ↑ by multiplication.
Agent
Host
and Environmental Factors
Bring agent and host together or produce a disease provoking stimulus.
In the human host.
Interaction of host & stimulus → Host reaction →
Early pathogenesis → Discernible early lesions → Advanced disease → Convalescence

Levels of prevention →	primary prevention		secondary prevention	Tertiary prevention	
Modes of intervention	Health promotion	Specific protection	Early diagnosis and t/x	Disability limitation	Rehabilitation

Envt → physical, biological, psychosocial envt

Agent factors:

1. Biological agents
2. Nutrient agents
3. Physical agents
4. chemical agents { → Exo → allergens and insecticide. ; → endo → Bb, ketones, stone, uric acid }
5. mechanical agents
6. Absence / Insufficiency / excess of a factor necessary for health
7. Social agents

→ Risk factors
→ Risk groups
→ Spectrum of disease

Iceberg Phenomenon

→ disease in a community maybe compared with an iceberg
floating tip of iceberg represents (clinical case)
→ what physician sees
→ Vast submerged portion
→ hidden mass of disease

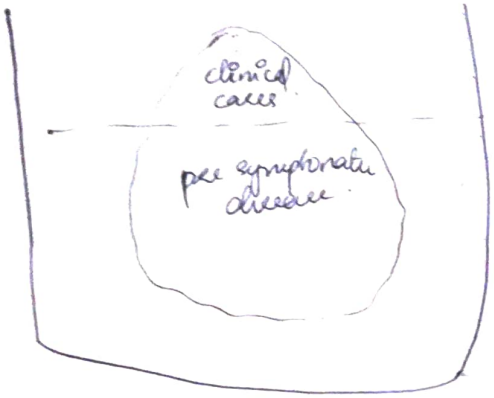
Host factors

→ demography
→ biological

→ latent, inapparent, presymptomatic and undiagnosed cases and carriers in community.

watershed → demarcation between apparent and inapparent disease.

eg. HTN, diabetes, anemia.



MONITORING & SURVEILLANCE.

- **Monitoring:**
  → performance and analysis of routine measurements aimed at detecting changes in the envt or health status pop^n.
- **Surveillance:**
  Continuous analysis, interpretation and feedback of systematically collected data generally using methods distinguished by their practicality, uniformity & rapidity rather than by complexities.
- **Sentinal surveillance:**
  method of identifying the missing cases and thereby supplementing the notified cases ~~is required~~
  - reporting bias minimized.

LEVELS OF PREVENTION.

1. primordial
2. primary
3. secondary
4. tertiary.

primordial (total pop^n)
→ prevention of risk factors
→ individual & mass education
→ including economic, social, envt cond: leading to causation

primary
→ action taken prior to onset of disease to prevent its occurrence
→ specific causal factors
  (a) pop^n (mass strategy)
  (b) high risk strategy
→ holistic approach
health promotion, specific protection

secondary
→ action which halts the progress of a disease and prevent complications.
→ early diagnosis & treatment
→ expensive & less effective than primary prevention.

tertiary
to reduce or limit impairments & disabilities, minimize suffering and to promote patient's adjustment to irremediable conditions.

Refer pack page 49 Table

MODES OF INTERVENTION

Attempt to intervene in the devpt of disease.

1. Health promotion
2. Specific protection
3. Early diagnosis & tx
4. Disability limitation
5. Rehabilitation

Health promotion

the process of enabling people to ↑ control over and to improve health

→ health education
→ envtal modification
→ Nutritional interventions
→ lifestyle and behavioural changes

Specific protection

→ immunization
→ use of specific nutrients
→ chemoprophylaxis
→ protection against occupational hazards
→ protection against accidents
→ protection from carcinogens
→ avoidance of allergens
→ control of specific hazards
→ control of consumer pdt. quality & safety of foods, drugs, cosmetics

Early diagnosis and treatment

- detection of disturbance of homeostatic and compensatory mechanisms while biochemical morphological & functional changes are still reversible
→ main interventions of disease control
→ critically impt to ↓ morbidity & mortality of certain diseases
→ mass treatment

Disability limitation

→ Done when patient reports late in pathogenesis phase
→ to prevent the transition of disease process from impairment to handicap

Disease → impairment → disability → handicap

Accident → disease
loss of foot → impairment
cannot walk → disability
unemployed → handicap

→ social, environmental & medical interventions

- Disability prevention
  - all levels of prevention
  - ↓ occurrence of impairment
  - Disability limitation by appropriate treatment
  - preventing transition of disability into handicap

Rehabilitation

Combined & coordinated use of medical, social, educational and vocational measures for training and retaining the individual to highest possible level of functional ability

- Enabling social integration.

(a) Medical rehabilitation
- restoration of function

(b) Vocational rehabilitation
- restoration of capacity to earn a livelihood

(c) Social rehabilitation
- restore family & social relationships

(d) psychological rehabilitation
- restoration of personal dignity and confidence

eg: school for blind and for crippled.
reconstructive surgeries - leprosy

SOCIAL MEDICINE.

Study of man as a social being in his total environment
- factors affecting distribution of health & ill health in popn.

EPIDEMIOLOGY.

The study of distribution and determinants of health - related states or events in specified population and application of this study to the control of health problems.

components → Disease frequency of disease
→ Distribution
→ Determinants of disease.

Incidence :

occurrence of only new cases in a defined population during a specified period of time.

$$\text{Incidence} = \frac{\text{No. of new cases of a sp. disease in a given period of time}}{\text{Popn at risk during that period}} \times 1000$$

Prevalence :

the total no. of all individuals who have an attribute or disease at a particular time or period divided by the population at risk of having attribute or disease at that time or period.

→ point prevalence
→ period prevalence

$$P = I \times D \rightarrow \text{duration}$$

$$P = \frac{\text{No of all cases (old + New)}}{\text{Total popn}} \times 100$$

Study methods

Epidemiological studies

- Observational
  - Descriptive
    - case report
    - case series
    - Survey
  - analytical
    - case control (individual unit of study)
    - cohort
      - ↓ follow up
    - cross sectional
      - ↓ prevalence (individual unit of study)
    - ecological
      - ↓ correlation (population unit of study)
- Experimental
  - ↓ RCT
  - field trial
  - community trials

Descriptive :

Observation of distribution of a disease in a community with reference to time, place and person & identifying age characteristics of the disease to formulate etiological hypothesis

Steps :

1. Defining the population to be studied
2. Defining disease under study
3. Describing the disease by
   - time
   - place
   - person
4. Measurement of disease
5. Comparing with known indices
6. Formulation of etiological hypoth

Time distribution : → short term fl.
→ periodic fl.
→ long term fl.

- short term

Common source ep
- single exp → food poison, Bhopal gas T
- continuous exp → score reaches STD and until

sudden rise sudden fall

sudden rise gradual fall

Propagated ep → person to person spread

gradual rise, gradual fall

Slow (modern) ep → NCD

- periodic fluctuations

Seasonal trend
- measles & chickenpox → spring
- URTI → winter
- Diahreal D → summer

Cyclic trend
- measles epidemic → 2-3 yrs
- Rubella → 6-9 yrs
- Influenza → 10 yrs

- Long term (secular)
changes in occurrence of disease over a long period of time

Uses
→ helps to know extent
→ distribution (time, place, person)
→ identify risk group
→ formulate etiological hypothesis
→ plan, organize, implement measures & procedure needed
→ helps in research

Analytical

(I) Case - Control.
- Retrospective
- case & control

Steps :
1. selection of cases
2. Selection of controls
3. Matching
4. Measurement of exposure
5. Analysis and interpretation

Step 1 → define disease, eligibility criteria, size, source
2 → "

Matching → process of selection of controls in such a way that not only they resemble case in all attributes and free from disease but also free from "confounding factor"

confounding factor
→ one which is not only associated with exposure under investigation but also can independantly act as a risk factor for the development of the disease under study

types:
→ group matching & pair matching

Odd's ratio → measure of strength of association between risk factor and outcome
↑ odds ratio, ↑ association of disease & factor

exception : Immunisation and Saline (odd's ratio < 1)

'p' value ≤ 0.05 → significant relation

> 0.05 → not.

Bias : error in research usually in contradictory results and wrong conclusion

1. Memory / recall bias
2. Selection bias
3. Confounding bias
4. Berkensonian bias
5. Interviewer's bias

advantage

- easy to carry out
- rapid, inexpensive
- require few subjects
- suitable for rare disease
- no risk to subjects
- allows study of etiological factors
- can identify risk factors
- no attrition problem
- minimal ethical problems

disadvantage

- memory / recall bias
- selection of app. control difficult.
- cannot measure incidence
- cannot distinguish cause & associated factors
- not suitable for evaluation of therapy

II Cohort Study

- prospective
  longitudinal study
  follow up study

→ study done to support or refute the association b/w suspected factor and disease of the etiological hypothesis

→ Both grps followed up over a period of time under identical cond: to determine the incidence.

→ studies from cause to effect.

types → prospective cohort study
→ Retrospective.
→ combination.

Eg: Framingham heart study

Steps :

1. Selection of study cohorts
2. Obtaining data on exposure
3. ~~Sele~~ Selection of comparison group
4. Follow up
5. Analysis

to study strength of association,

→ relative risk. I_E / I_O

→ attributable risk $\left(\frac{I_E - I_O}{I_E}\right)$

→ Absolute risk

→ Pop^n attributable risk

advantage :

1. Incidence can be calculated
2. Several outcomes related

5 exposures can be studied simultaneously
3 helps to estimate relative risk.
4 Dose response ratios can be calculated
6 Since comparison groups formed before disease develops, some bias can be minimalized

Disadvantages:
1. unsuitable for uncommon diseases
2. ~~takes~~ expensive, time consuming and difficult.
3 administrative problems are inevitable
4 Attrition can occur (death, migration, dropouts)
5 involves ethics

RCT.

Patients in study gp & control gp are allocated at random to eliminate bias.

Steps
1. Drawing up a protocol.
2. Selecting reference and experimental populations.
3. Randomisation
4. Manipulation or intervention
5 Follow-up
6 Assessment of outcome.

Randomisation:
- heart of clinical trial.
- every individual has an equal chance of being selected into either study group or control group from the reference population
→ eliminates bias (selection bias)

Bias:
→ subject variation
→ observer bias
→ bias in evaluation

Blinding → to overcome these errors and bias
1. Single blind trial (participant unaware)
2. Double " (doctor & participant unaware)
3. Triple " (doctor, pt & analyst or statistician unaware)

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phases of clinical trials:
phase 1 → 10 - 30 people
↳ safety & efficacy
& - 12 months.

phase 2 → 50 - 500 people
dosage schedule
18 - 24 months.

phase III → 1000 s.
Safety, efficacy, immune response
3 years

phase 4 → continuous ongoing long term effects

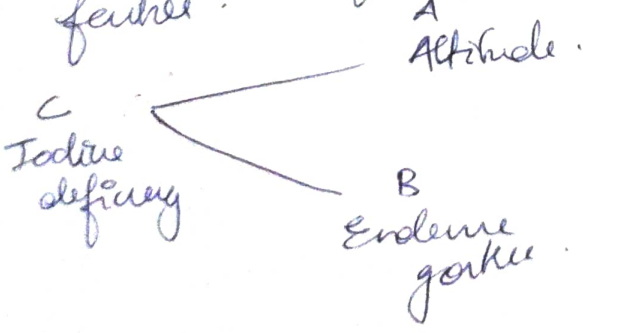
Other study designs
1. Concurrent parallel study d.
2. ~~Double blind~~ Cross-over SD.

Association: the concurrence of two variables more often than would be experienced by chance
- does not always imply correlation

- Types of association:
  (a) Spurious association
  (b) indirect association
  (c) direct association (cause)
    - one to one causal ass.
    - multifactorial causation

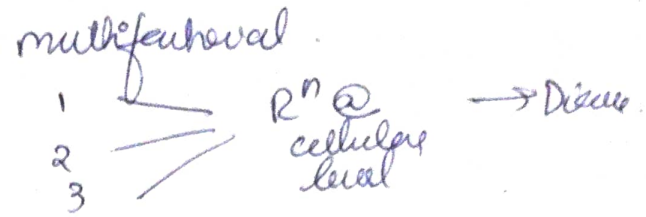
(1) Spurious
- not real association
study on UK → neonatal mortality
home & hosp - delivery
selection bias

(2) Indirect.
statistical ass. b/w a characteristic of interest & disease due to presence of confounding factor.



(3) Direct.
(i) one to one
If factor A ✓ then B ✓ (disease)
& vice versa
eg: Koch postulate
but single cause → multiple outcome

(ii) multifactorial



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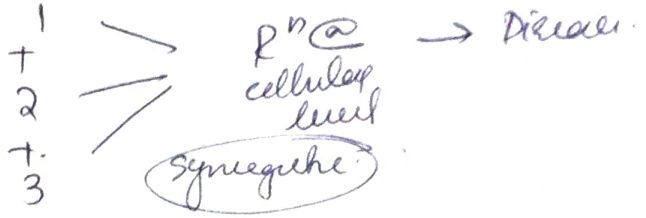

Bradford - Hill's criteria for causality OR Additional criteria for judging causality

1. Temporal association.
2. Strength of association.
3. Specificity "
4. Consistency "
5. Biological plausibility.
6. Coherence of association.

Causality:
↳ association is said to be causally associated when one event invariably gives rise to another event without exception.

① → cause must precede effect
② → RR / odds ratio is high
③ → attributable risk high
④ → similar results from different settings, place & methods
⑤ → explained via biological mechanism
⑥ Coherence → historical evidence

Uses of Epidemiology

1. To study historically the rise and fall of disease in the popn.
2. Community diagnosis (risk of disease wrt. time, place person)
3. Planning and evaluation.
4. Evaluation of individual's risks and changes
5. Syndrome identification
6. Completing the natural history of disease.
7. Searching for causes and risk factors.