CONCEPT OF HEALTH, HEALTH CARE AND DISEASES

Changing concepts of health 00:01:40

1. Biomedical concept : Any alterations or changes in biological functioning of a person (disease).
2. Ecological : Person is in balance with the environment.
3. Mental stability : Mental state tuned with physical state of the body.
4. Holistic concept : New, most accepted. All the above concepts together.

Health (WHO defintion, 1948) :

Health is a state of complete physical, mental and social well-being and not merely an absence of disease (biomedical health) or infirmity.

Dimensions of health :

1. Physical dimension.
2. Mental.
3. Social.
4. Spiritual.
5. Emotional.
6. Vocational.
7. Other ecological dimensions.

Concept of well being :

- Standard of living :
  - Income.
  - Assets.
  - Occupation.
  - Socio economic status.
- Level of living :
  - Health.
  - Food consumption.
  - Education.
  - Occupation.

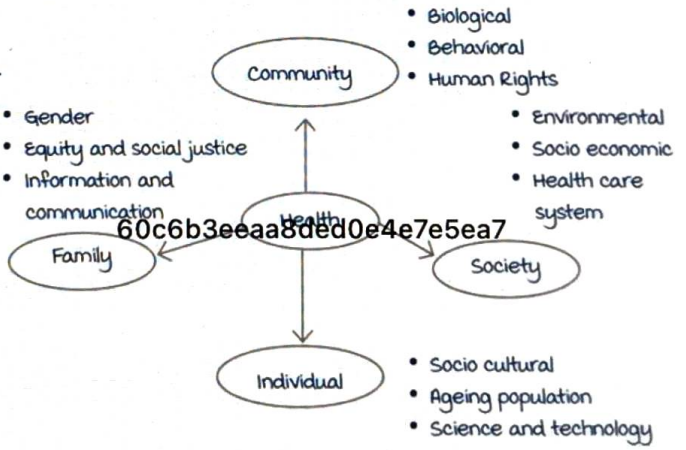
Housing.
Social security.
Clothing.
Recreation and leisure.
Human rights.

- Quality of Life :
  Happiness.
  Physical Quantity of Life Index (PQLI).

Spectrum of health

00:07:04

Determinants of Health :



In total, there are 12 determinants of health.

Right to Health :

- Right to health (UN, 2000).
- Article 25 : Universal declaration of human rights.
- Article 5 : Elimination of racial discrimination.
- Article 11,12,14 : Elimination of discrimination against women.
- Article 24 : Convention on child rights.

Active space

- Article 25 : Convention on rights of persons with disabilities.

Responsibility for health :

- Individual responsibility.
- Community responsibility.
- State responsibility : Government factors.
- International responsibility : Health care facilities with features avilable at national + international level.

Healthcare features of a country :

1. Appropriateness.
2. Comprehensiveness.
3. Adequacy.
4. Availability.
5. Accessibility.
6. Affordability.
7. Feasibility.

Levels of health care

00:13:31

Primary	Secondary	Tertiary
• Basic health care. • Disease prevention. • Health promotion. • Curative services. (Disease control).	• Highly specialized diagnostic modalities • Treatment facilities.	• Rehabilitation. (Disability limitations) • Highly specialized management and care.
Polyclinics, primary health centres, subcentres.	Nursing homes.	Multispeciality hospitals, medical colleges

International Health Care System :

1. Health for all by 2000 AD under the Alma Atta conference – World Health assembly, May 1977.
2. Health promotion :
   - Ottawa charter for health promotion, 1986.
   - Jakarta declaration on health promotion, 1997.

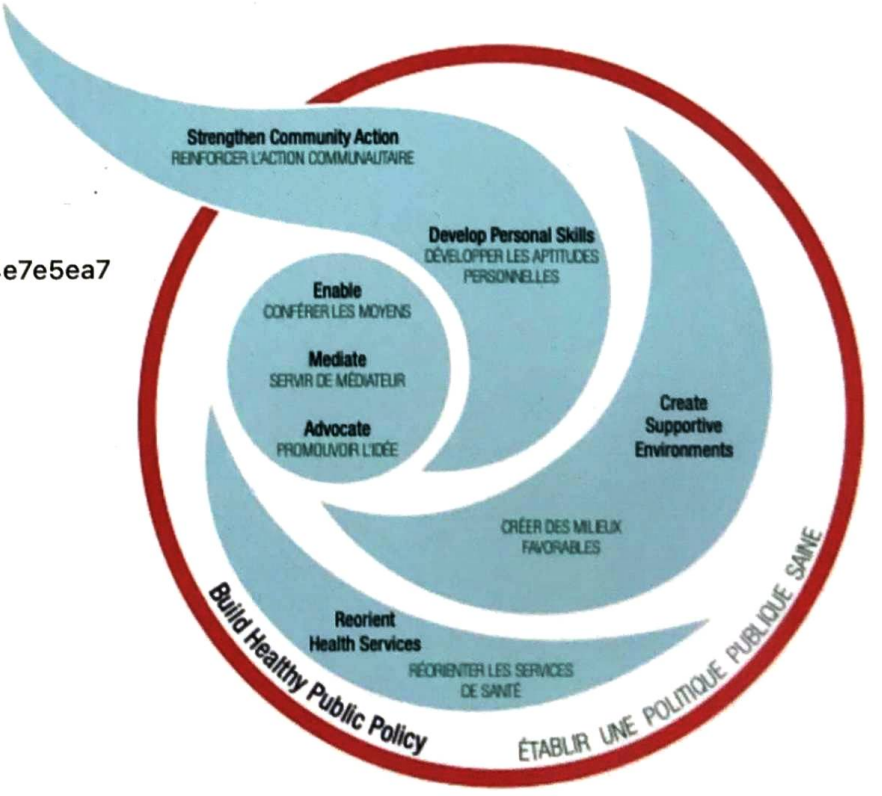
5 elements of Health promotion under Ottawa charter :

- Build healthy public policy.
- Create supportive environment.
- Strengthen community action.
- Develop personal skills.
- Re-orient health services.

3. Millennium Development Goals (MDG)
   - Formulated in 2000, applicable till 2015.
   - 8 Goals.
4. Sustainable development Goals (SDG)
   - Started in 2015, ending in 2030.
   - 17 goals.
   - #3 : Health related goal. (Green colour symbol)

Enable
mediate
Advocate

3 wings including the 5 policies of Ottawa charter.



Active space

- 1st level : Good climatic system (Biosphere).
- 2nd level : Society (country/state).
- 3rd level : Economy (Partnership to achieve goals)

Goals under #3 goal :

Goal	Target
3.1	By 2030, reduce global MMR < 70
3.2	By 2030 reduce NMR < 12/1000 live births. Under 5 mortality rate <25/1000 live births.
3.3	By 2030, end epidemic of AIDS, TB, Malaria & neglected tropical diseases.
3.4	By 2030, reduce by 1/3rd premature mortality from non communicable diseases.
3.5	Prevention and treatment of substance abuse.
3.6	By 2020, halve the number of global deaths and injuries from road traffic accidents.
3.7	By 2030, ensure universal access to RTI/STI services, family planning services.
3.8	Universal health coverage, assess to essential medicines and vaccines for all.
3.9	By 2030, reduce deaths and illnesses from chemicals and air, water and soil pollution and contamination.
3a	Strengthen tobacco control implementation.
3b	Support research and development of vaccines and new treatment.
3c	Increase health financing and recruitment.
3d	Strengthen the capacity of all countries for early warning, risk reduction and management of national and global health risks.

Active space

Health services research

00:22:43

Biomedical research :

- Biological events.
- Prevention and control.
- Improving treatment modalities.

Intersectoral research :

- To involve more partners for taking care of health.
- Example : Ministry of health and family welfare, Women and child development ministry, Ministry of finance, etc.

Health services (systems) research :

- Improving the other sectors.

Concept of Disease :

Ecological concept :

- Person is not happy with the environment, hence dis-eased.

Sociological concept :

- Cultural factors.
- Political factors.
- Environmental factors.
- Biological factors.

Disease :

- Biological problem/Pathogenicity.
- Abnormality in the body.
- Can be tested.

Illness :

- Sense /feeling of not being healthy.

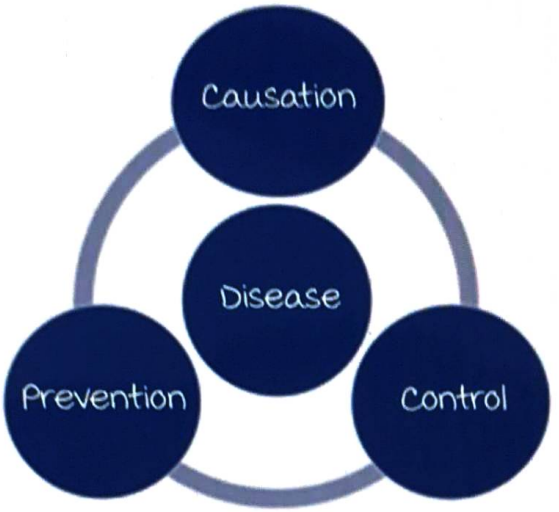
Sickness :

- Social phenomenon (Social rule not fulfilled).
  Example : Sickness absentism (sick leaves).
  Indicator of health status of community.

CONCEPTS OF DISEASE CAUSATION AND CONTROL

Three things to find in a disease :

- Causation of the disease.
- Control of the disease.
- Prevention of the disease.



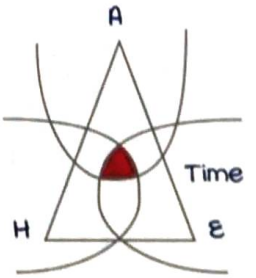
Concept of disease causation

Epidemiological triad :

1. Agent.
2. Host.
3. Environment.

Epidemiological triangle : Interraction of

1. Agent.
2. Host.
3. Environment.
4. Time.



Epidemiological triangle

Advanced epidemiological triangle :

1. Causative factors.
2. Population.
3. Environmental, political, socioeconomical, nutritional and cultural factors.
4. Time.

Iceberg phenomenon :

The submerged portion of iceberg corresponds to the inapparent cases (subclinical cases).

The tip of the iceberg corresponds to the clinically apparent cases.

more the inapparent cases, more problematic the disease is.

The diseases that show Iceberg Phenomenon (IP) :

"P M Jumped In Ditch To Have Ruby".

1. Polio : 75% to 80% show IP.
2. Mumps.
3. Japanese encephalitis.
4. Influenza : 50 to 70% show IP.
5. Diphtheria.
6. Typhoid.
7. Hepatitis A and B virus.
8. Rubella : 40% to 50% show IP.

The diseases that do not show iceberg phenomenon :

1. Tetanus.
2. Rabies.
3. Measles.

Concept of control 00:09:51

Control phase :

The phase in which the disease is no more a public health problem (decrease the magnitude / prevalence of the disease).

60c6b3eeaa8ded0e4e7e5ea7

Eg. NVBDCP (National vector borne disease control program).

NIDDCP (National iodine deficiency disorder control program).

NPCB (National program for control of blindness).

Elimination phase :

There are no new cases.

There is interruption of transmission of an agent.

Temporary phase (as it may go back to control phase).

Active space

Eg. NTELP (National tuberculosis elimination program),
NMELP (National measles elimination program).

Eradication phase :

There are no new cases.
Extermination of the agent (hallmark).
Permanent phase.
Eg. NLERP (National leprosy eradication program).

Isolation and quarantine 00:16:03

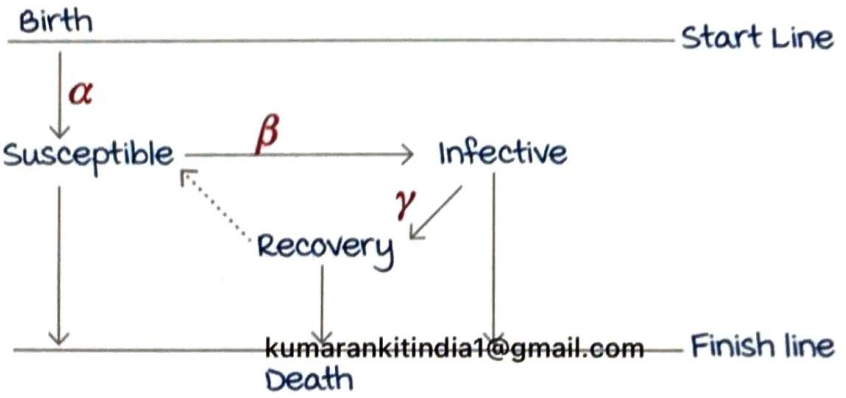
Isolation :

It is done for people with a disease (diagnosed), to prevent spreading it to others.
It is done for the period of communicability (independent of incubation period).

Quarantine :

It is done for apparently healthy individuals.
It is done for the maximum incubation period known.

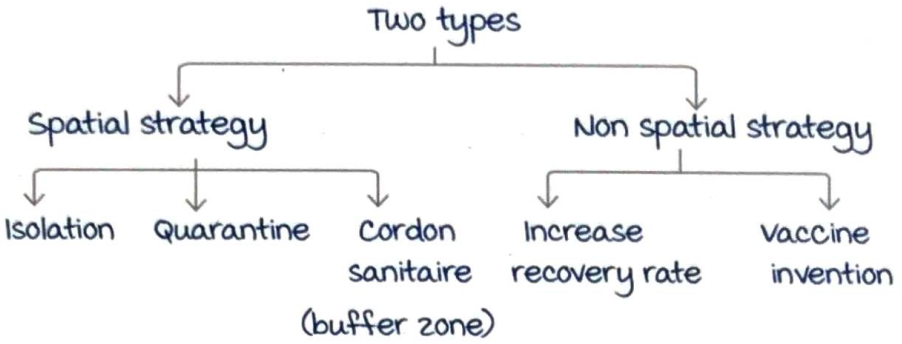
Infection cycle 00:21:09



α : Susceptibility rate (depends on birth rate of the population).
β : Infection rate / infectivity potential of the agent.
γ : Recovery rate.

Models of control

00:23:44



Spatial strategy : When people are blocked in spaces.
Nonspatial strategy : Without any space discretion.
Done by : • Increasing recovery rate (treating the patients).
• Blocking infective rate (by vaccines).

Spatial strategy : Isolation & quarantine

00:26:00

Defensive isolation : Diseased people are contained inside.
Ex : Covid wards.

Offensive containment : Forming a barrier around healthy people from diseased individuals.
Ex : COVID-19 lockdowns.

Absolute quarantine : No freedom of movement.

Modified quarantine :
Partial limitation/relaxation (e.g curfews).
It is based on time, type of business, special age, immune passports.
It requires high amount of serosurveillance.

Segregation : Building buffer zones.
It is for separating special age group population (old age and children).
It is called cordon sanitaire.
Comes under modified quarantine.

Concept of prevention

00:31:36

	Risk factor	Disease	Complication	Death/ disability
Primordial prevention	×	×	×	×
Primary prevention	✓	×	×	×
Secondary prevention	✓	✓	×	×
Tertiary prevention	✓	✓	✓	×

Primordial prevention :

- Prevent establishment of risk factors.
- Lifestyle modification / health promotion.

Primary prevention :

- Risk factor is present.
- Lifestyle modification and disease prevention.
- Other examples : Immunization (specific protection).
  Family planning methods.
  Chemoprophylaxis.
  Food safety.
  Use of helmets.
  Use of mosquito nets.
  Health education.

Secondary prevention :

- Disease is present.
- Prevention of complication of a known disease.
- Includes early diagnosis by screening, prompt treatment.
- Example : DOTS for TB, MDT for leprosy.

Tertiary prevention :

- Complication is present.
- Prevention of disability or death.
- To prevent disability limitation (in case of trauma/injury).
  Example : Putting a cast over fracture to prevent malunion/ non-union as these can cause disability.
  Resting of muscles.

Rehabilitation : Reconstructive surgery.
Blind schools.
Mobility aids.
Transplant surgeries.
Prosthesis.

Examples :

1. 18 year old male does yoga : Lifestyle modification/ health promotion → Primordial prevention.

2. 50 year old hypertensive male does yoga : Lifestyle modification → Disease prevention (prevents risk of cardiovascular diseases) → Primary prevention.

3. 50 year old diabetic male does yoga to keep his diabetes under check → Secondary prevention.

4. 50 year old diabetic male with leg problems, neuropathy, pulmonary fibrosis does yoga → Tertiary prevention.

Quaternary prevention 00:44:16

Prevention of over-diagnosis because of evidence based medicine and offer ethically proven treatment or investigation choices.

HEALTH AND DISABILITY INDICATORS

Indicators

00:00:27

1. Mortality indicators : Death indicators.
2. Morbidity indicators : Indicator of sickness.
3. Utilization indicators : Practices of population.
4. Service indicators : Facilities provided by government.
5. Socio economic indicators (most important).
6. Disability indicators.
7. Health/development indicators.

Indicator : Target in the space (mid term milestones).

Index : Composite amalgamation of indicators.

60c6b3eeaa8ded0e4e7e5ea7

Objective : Short term end point.

Targets : Mid term milestones.

Goals : Something desired, long term desirable end points.

Indicators should be :

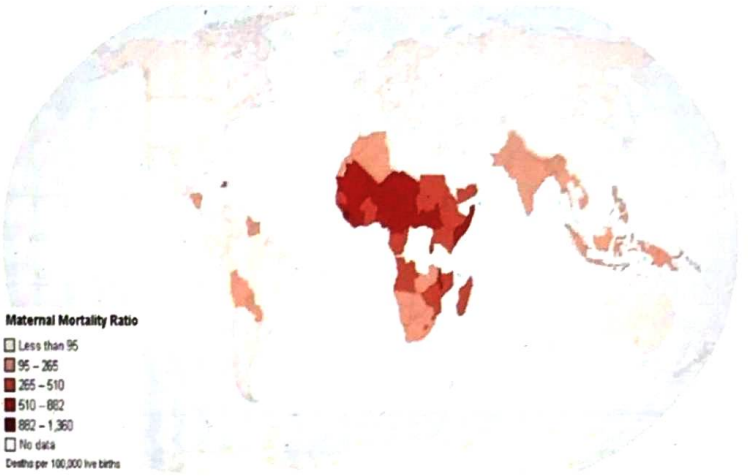
1. Valid.
2. Reliable.
3. Sensitive.
4. Specific.
5. Feasible.
6. Relevant.

Mortality indicators (death indicators) :

- Crude death rate.
- Neonatal mortality rate.
- Infant mortality rate.
- Maternal mortality ratio.
- Proportional mortality rate.
- Life expectancy : Positive death indicator.
  As per UNDP, for India, in 2021, life expectancy was recorded to be 69.7 years.

Active space

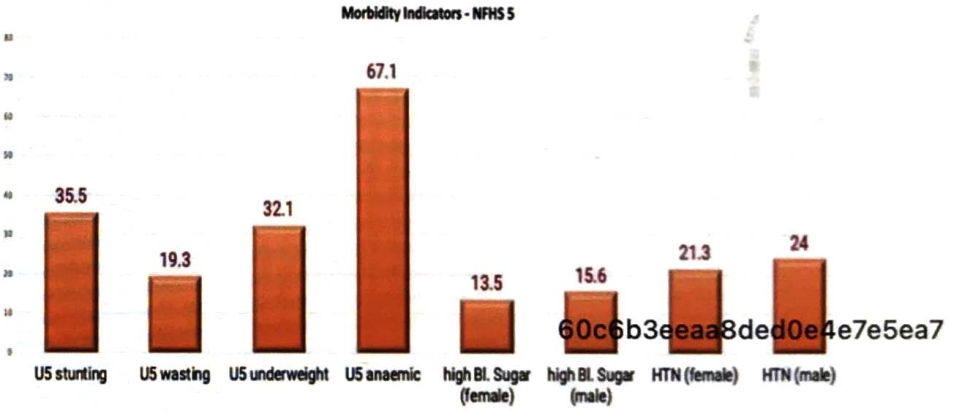
- Maximum life expectancy → Hong Kong (89.9 years).
- Lowest around 52 – 53 years.



Morbidity (sickness) indicators

00:07:31

- Prevalence : Total (old + new) cases; expressed in proportions/percentages.
- Incidence : Total number of cases per unit time.
- Notification rates : How many people get the disease.
- Hospital admission rates : Burden of diseases in the society.
- Average length of stay : Chronicity of the disease in the society.



- Conducted in 2019 – 2020.
- Data released in 2021.

3. Utilization rates :

It tells about the utilisation of the services provided.

- Immunization rates.
- ANC, PNC, FP use.

Active space

- **Bed occupancy rates :**
  - Bed days of occupancy.
  - Important indicator for utilization of healthcare facility in the population.
  - $\frac{\text{Total bed days used}}{\text{Total beds available in a year}} \times 100$

- **Bed turnover rates :**
  - Important indicator of efficiency of a healthcare facility.
  - $\frac{\text{Total discharges+deaths+transfer outs}}{\text{Total beds available in a year}} \times 100$
  - Differentiates between acute (high) and chronic (low) care.

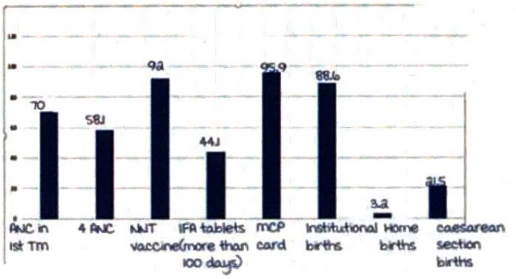
Bed supply rate :

- Public health indicator.
- According to WHO, > 5/10000 population.
- $\frac{\text{Beds available}}{\text{Total population served}} \times 1000.$

Average length of stay :

- $\frac{\text{Total duration of stay (discharge or death)}}{\text{Total number of discharge or deaths.}}$
- Morbidity indicator (level and type of sickness in the area).

Iron and Folic acids (IFA) tablets should be taken from 2nd trimester, for 180 days during pregnancy and 180 days during lactation, according to Anemia Mukt Bharat program.



MCH indicators by NFHS 5

For example : The percentage of women who utilised IFA tablets services were just 44.1%

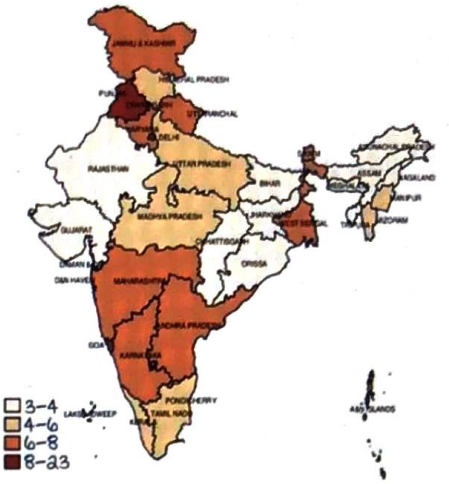
Active space

Service indicators

00:17:04

Public health indicators :

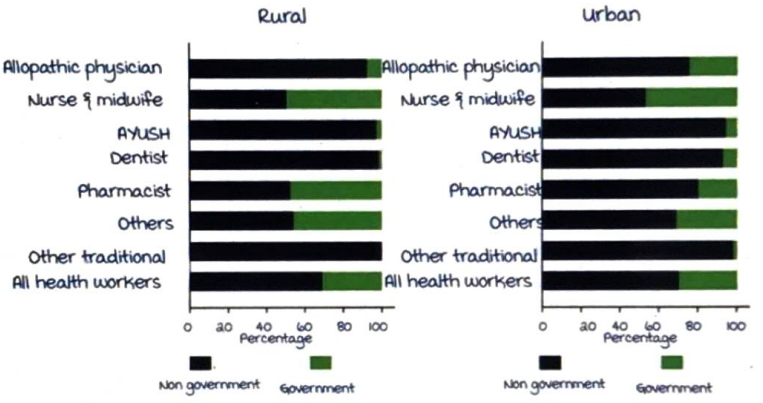
- Doctor population ratio.
- Doctor : Nurse ratio.
- Health Centre : Population ratio
- Bed supply rate.



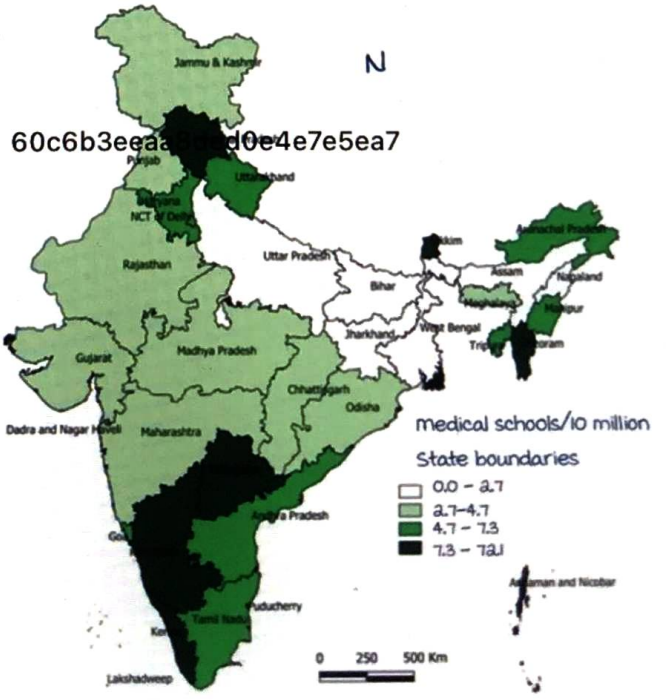
Source : Census of India, 2001

Doctor density, 2005 (Per 10 000 Population).

Punjab has the highest doctor density per unit population.



Distribution of health workforce by sector, 2005.



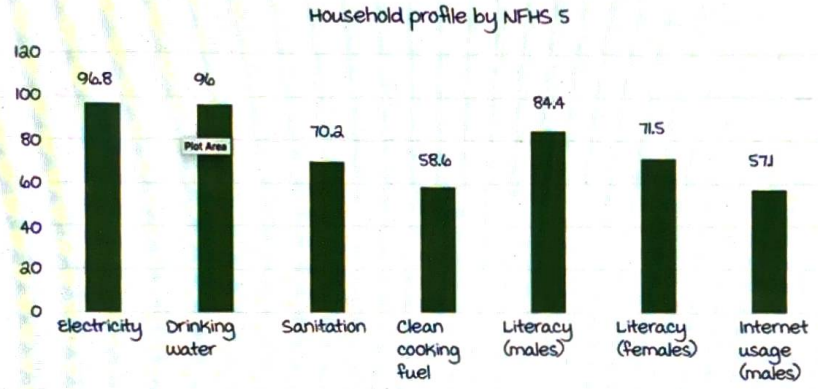
Distribution of medical colleges per unit population.

Active space

Socio Economic Indicators (demographic indicators) :

About the development of the area.

- Housing rates.
- Calorie per capita.
- Family size.
- Growth rates.
- Dependency ratio : $\frac{\text{Age (<14 years + >65 years)}}{\text{15 - 64 years}} \times 100$
- Literacy rates : Number of adults who can read and write in any language/age >15 years) x 100.
- Effective literacy rate : Number of people who can read and write in any language/age >7 years) x 100.



UNDP projection data (2030) :

- Country to have 150+ crores population.
- Old age dependency : 9.5.
- Young age dependency : 39.7.
- Sex ratio at birth (no of males : females) 1 : 1.
- Life expectancy : 69.7 years.

Disability indicators

00:22:24

I. Person type : Person disabled.
   - Limitation of mobility.
   - Limitation of activity.

II. Event type : mental disability (patient had no mood to work).
   - Number of days of restricted activity.
   - Bed disability rates.
   - Work loss dates.

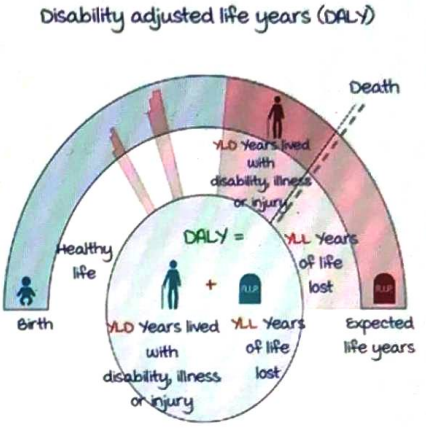
Active space

Impairment	Disability	Handicap
Anatomical loss/ loss of physiological function.	Loss of activity/ action.	Loss of social role/ loss of occupation or job or money.
Clinical criteria : used in hospitals.		Social phenomenon. Handicap quota.

Disability indicators :

DALY (Disability Adjusted Life Years) includes :

- Years lost to life (YLL) : Number of years lost due to premature death.
- Years Lived with Disability (YLD).



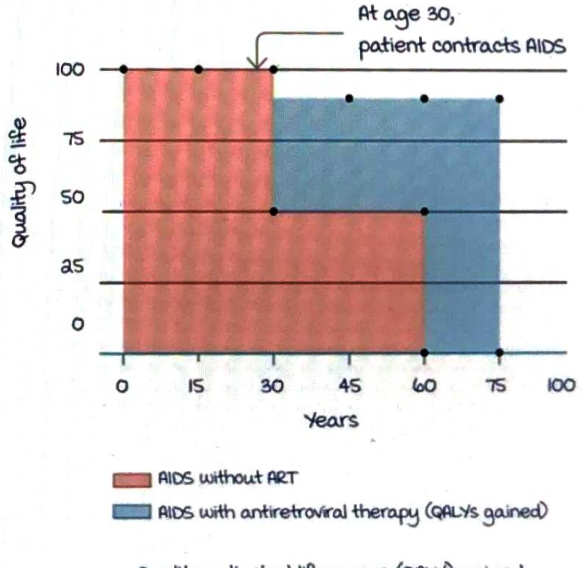
DALY is used to measure the burden/severity grade of a disease on a person.

DALY = YLL + YLD.

Highest DALY : Seen with depression.

QALY (Quality Adjusted Life Years) :

- Number of quality life years gained because of an intervention (by the Government of India).
- Effectiveness of an intervention, in terms of money or the finances spent and gained.



Quality adjusted life years (QALY) gained

HALE (Health Adjusted Life Expectancy) :

- Number of years spent by a population in good health.
- Positive indicator.
- measured at a country's level.
- Calculated by life expectancy minus DALY of all diseases.
- HALE is a good indicator of health status of a country.
- Also indicator of efficiency of health system in a country

Sullivan's index :

- Similar to HALE, but in individual type.
- Number of years a person will spend in good health.
- Dependent on age, prognosis of disease, type/grade of disease.

60c6b3eeaa8ded0e4e7e5ea7

Sullivan's index = Life expectancy in that area – DALY.

International Classification of Disease (ICD) 00:43:21

1. International classification of disease.
2. International classification of health interventions.
3. International classification of functioning, disability and health.
4. Other classifications : Disabilities, oncology, primary care, nursing practices.

International classification of disease (ICD 11) :

Launched on 01. 01. 2022.

27 chapters = 26 (health) + 1 (chapter X).

New chapters :

- Disorders of immune system.
- Disorders of blood and blood forming organs.
- Conditions related to sexual health.
- Sleep wake disorders.
- Traditional medicines.

- Extension codes (chapter X).

ICD 11 has :

- 4 category chapter codes, 2 subcategories (optional).
  E.g., Covid virus identification : Code is RA01.0
  (2 letters, 2 numbers, optional subcategory format).

Active space

- Improvised browser, application based tools.
- Arabic numeral chapter numbers (previously roman numbers).
- Browser based : Complete chapter description.

Active space

HEALTH AND DEVELOPMENT INDICES

Physical quality of life index (PQLI) 00:01:08

PQLI includes :

- Life expectancy at 1 year of age.
- Effective literacy rate : Age > 7 years.
- Infant mortality Rate (IMR) : Death before 1 year of age. PQLI reflects how happy people are.

Human Development Index (HDI) :

Dimensions	Indicators
1. Healthy life	Life expectancy at birth
2. Knowledge/Education	Average (mean) school years. Expected school years.
3. Standard of living	GNI per capita (GNI : Gross National Income) from agriculture, business earning etc.

Dimension index to calculate HDI :
UNDP (United Nations Development Program) fixed minimum & maximum value for every country.

	min	max	Observed (2021)
Life expectancy (in years)	20	85	69.7
Expected years of schooling	0	18	12.2
Mean years of schooling	0	15	6.5
Gross national income per capita (2017 PPP $)	100	75000	6681

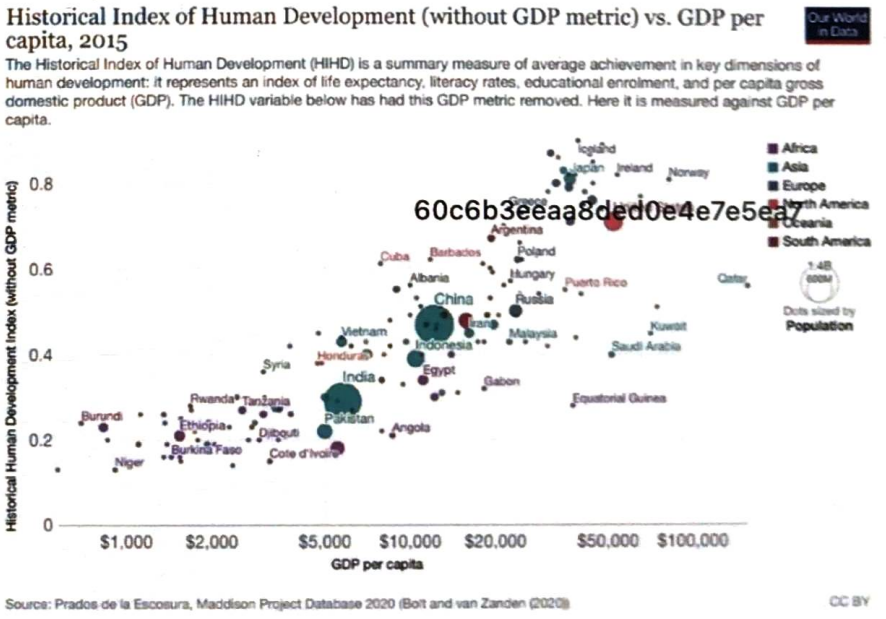
$$\text{Dimension Index} = \frac{\text{Actual value} - \text{Minimum value}}{\text{Maximum} - \text{Minimum value}}$$

HDI is a geometric mean of all dimension indices.
For India, HDI : 0.64, rank : 131 (according to 2021 UNDP report).

Inequality adjusted human development index (IHDI) :
Average GNI might be same but not every people in the country earn the same, are of same age, same gender.
IHDI is the better indicator than HDI.

Historical index of human development 00:10:27

Dimensions (same as HDI)	Indicators
Healthy life	Life expectancy at birth
Knowledge	Gross enrollment rate, adult literacy rate > 15 years of age
Income	GDP per capita (GDP : Gross Domestic Product) without foreign national income.

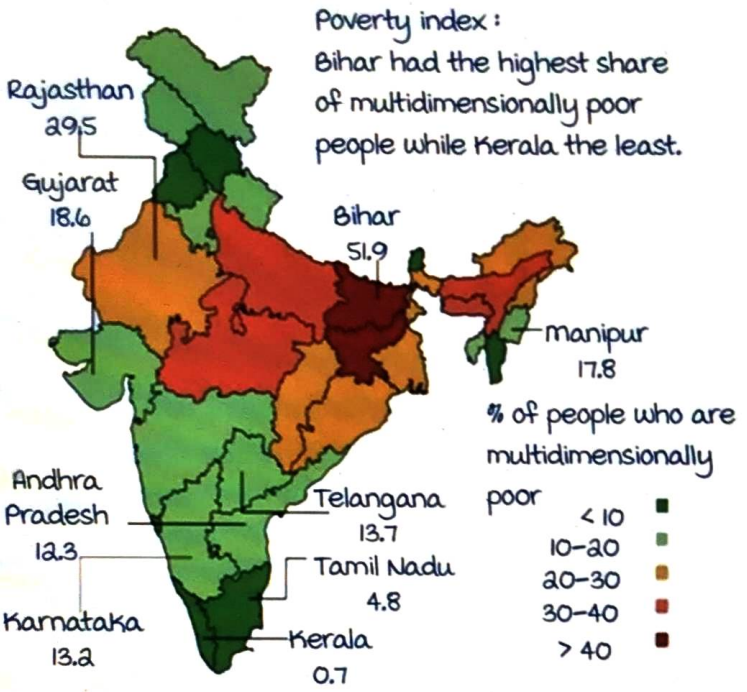


Norway has maximum HDI (most developed country) & high life expectancy, national income.

Active space

Multidimensional poverty index (MPI) : Opposite to HDI.

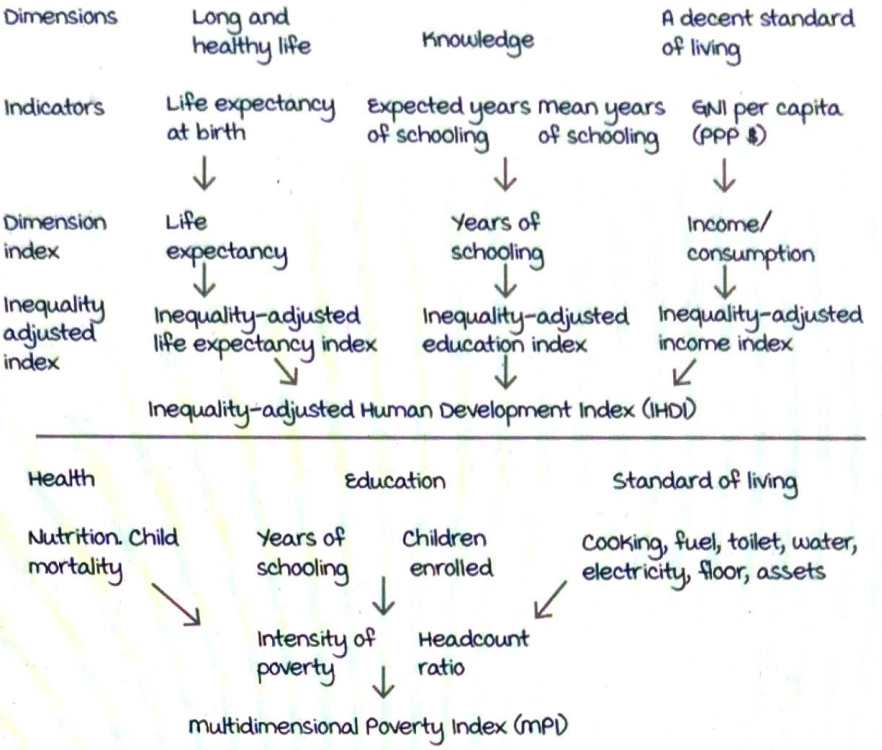
- In MPI, poverty is taken into account.
- It considers deaths rates like under-5 mortality rates.
- Shows school drop out/illiteracy rates (< 6 years of school/no education till class 8).
- Shows poverty rates like abscence of water, sanitation.
- In India, maximum MPI : Bihar (data from NITI Aayog)



10 indicators of poverty :

Standard of living	Education	Health
Household cooks with dung, wood, charcoal or coal.	Atleast 6 years of school	Undernourishment
No sanitation	Not completed 8th class	Not surviving till 18 years of age
No drinking water		MPI
No electricity		
Kuchha house		
No modern gadgets as TV, telephone, computer, car etc.,		

Active space

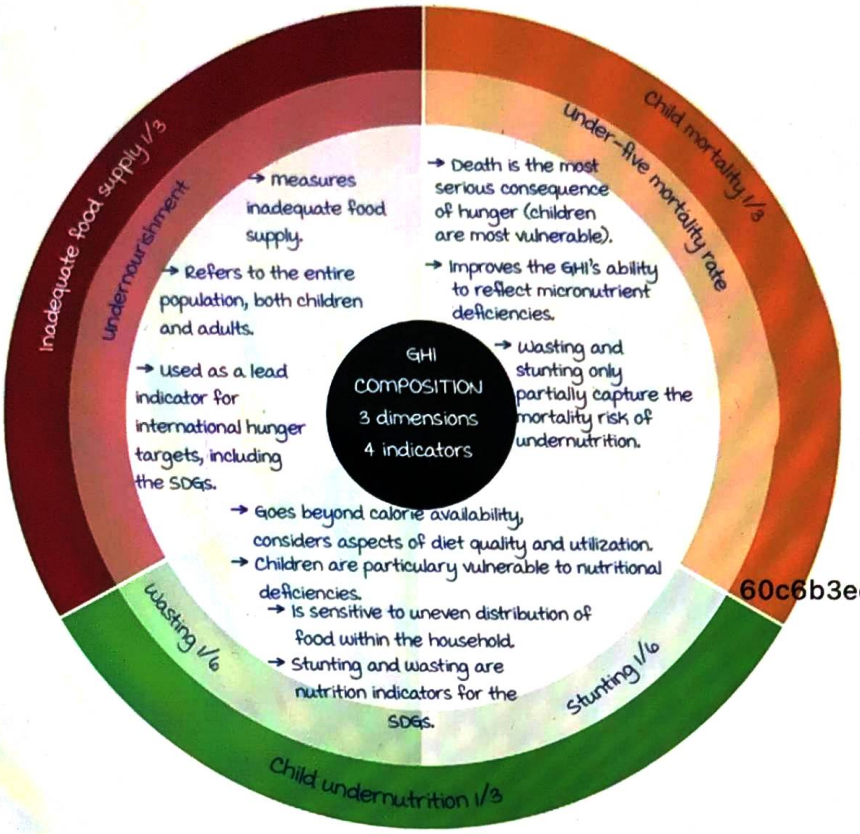


Global Hunger Index (GHI) 00:18:21

Dimensions	Indicators	Weightage given
Child mortality rate	Under 5 mortality rates	1/3
Child undernutrition	Wasting rate (Acute) Stunting rates (Chronic)	1/6 + 1/6 = 1/3
Inadequate food supply	Undernourishment rates (in adults)	1/3

GHI is a simple arithmetic mean of all 4 indicators/3 dimensions.

GHI of India : 27.5 (serious level of hunger).



Global Hunger Index Score

$$= \frac{\text{Undernourishment} + \text{Underweight} + \text{Under 5 mortality rate}}{3}$$

Health For All Indicator (HFA) :

- It is a WHO indicator.
- 4 dimensions :
    1. Health policy indicators.
    2. Socio-economic indicators.
    3. Health care service indicators.
    4. Health status indicators.

Health policy indicators :

1. Political commitment to Health for All.
2. Resource allocation.
3. The degree of equity of distribution of health services.
4. Community involvement.
5. Organizational framework and managerial process.

Active space

Social and economic indicators related to health :

1. Rate of population increase.
2. GNP or GDP.
3. Income distribution.
4. Work conditions.
5. Adult literacy rate.
6. Housing.
7. Food availability.

Indicators for the provision of health care

1. Availability.
2. Accessibility.
3. Utilization.
4. Quality of care.

Health status indicators :

1. Low birth weight (percentage)
2. Nutritional status and psychosocial development of children.
3. Infant mortality rate.
4. Child mortality rate.
5. Life expectancy at birth.
6. Maternal mortality rate.
7. Disease specific mortality.
8. Morbidity : Incidence and prevalence.
9. Disability prevalence.

Health index of india /NITI aayog indicator 00:26:54

Health Index of India (HII) is based on 3 parameters.

Parameters	Weightage
Health outcomes (NFHS-5 indicators)	70%
Governance and information (CMO/DTO/senior officials)	12%
Key inputs and processes (FRU/CHC/PHC)	18%

Active space

Summary :

	PQLI	HDI	HIHD	MPI	GHI
Survival	LE at 1 year	LE at birth	LE at birth	Death < 18 years	U 5 MR
Education	Literacy rate	mean school years	Adult literacy rate	< 6 years of school	
		Expected school years	School enrollment rate	No education till 8th class	
Living standard/ economic status	IMR	Gross national income	Gross domestic product	Low standard of living	Under nutrition
					Inadequate food supply

LE : Life expectancy

Active space

INFECTIOUS DISEASE EPIDEMIOLOGY : PART - 1

60c6b3eeaa8ded0e4e7e5ea7

Basic definitions

00:01:45

Infection : Entry and development of an agent (usually micro organism) in the body.

Infestation : Presence of arthropod vector on the body or clothes.

Contamination : Presence of an infective agent/vector/ arthropod on any surface or non-living things.

Infectious disease : Any disease which happens due to an infectious agent or infectious etiology.
Example : Rheumatic fever, cervical cancer, infective endocarditis, peptic ulcer disease.

Contagious disease : Transmitted by direct touch.
Example : Dermatitis, scabies, etc.

Communicable disease : Any disease which may transmit via any mode of transmission.
Example : TB.

Opportunistic infection : Infections which may happen in case of any immunodeficiency or immunosuppression.
Example : HIV – Toxoplasmosis/CMV retinitis/pneumocystis jirovecii, pneumonia.

Active space

Nosocomial infection

00:07:49

Hospital Acquired Infections (HAI)/ nosocomial infections are those infections that arise as new infections after 48 hours after admission.

MC organism : Staphylococcus aureus.
MC mode of transmission : Unclean hands.
MC infectious disease : Nosocomial related UTI (due to retained catheters).

Iatrogenic : Group of diseases which are due to procedures in the health facility.
Reasons : May be due to medical negligence, procedural, adverse reactions, side effects.

Exotic : Any disease or infection not found locally.
Example : Rabies in United Kingdom, yellow fever in India.

Zoonoses

60c6b3eeaa8ded0e4e7e5ea7

00:13:38

Disease arising due to or related to animals.
Example : Rabies, brucellosis, leptospirosis.
Based on origin/source :
3 types :

- Zooanthroponosis : Humans to animals.
  Example : TB.
- Anthropozoonosis : Animals to humans.
  Example : Rabies.
- Amphixenosis : Animals to humans and vice versa.
  Example : Staphylococcus or streptococcal infections.

Other type of classification :

1. Based on transmission :
   - Direct zoonoses : Directly from bite.
   - Cyclozoonoses : 2 or more animals involved.
   - Metazoonotic : 2 or more animal or non-vertebrate host.
   - Saprozoonoses : Animal or non-animal source. Eg : Mycosis.

Epizootic : Has epidemic levels in animals.
Example : Plague.

Active space

Enzoonotic : Has endemic levels in animals.
Example : Any staph infections or worm infections.

Epornithic : Diseases which originates from birds having epidemic levels.
Example : Psittacosis.

Sporadic : Scattered cases.
Example : Tetanus, anthrax

Endemic : Persistent presence of disease in an area.
Example: Typhoid, hepatitis, soil transmitted helminthic infections, etc.

Epidemic : Sudden or gradual rise in number of cases which is more than 80% of expected frequency or more than + 2 SD.

Difference between epidemic and outbreak :

Epidemic	Outbreaks
Broader area and no boundaries	Smaller/regional/defined areas

Pandemic

00:27:26

Pandemic : When a disease crosses 2 WHO regions or crosses a large water body or continents.

WHO regions & headquarters :

WHO regions	Head quarters
1. Region of America	Washington DC.
2. Region of Africa	Brazzaville, Congo.
3. Eastern Mediterranean	Cairo, Egypt.
4. Southeast Asian region (SEAR)	New Delhi, India.
5. West pacific region	Manila, Phillippines.
6. European region	Denmark

Diseases under pandemic notification system (International health regulation) :

Mnemonics : CYPIPC.

Cholera.

Yellow fever.

Plague.

Influenza.

Poliomyelitis.

COVID – 19.

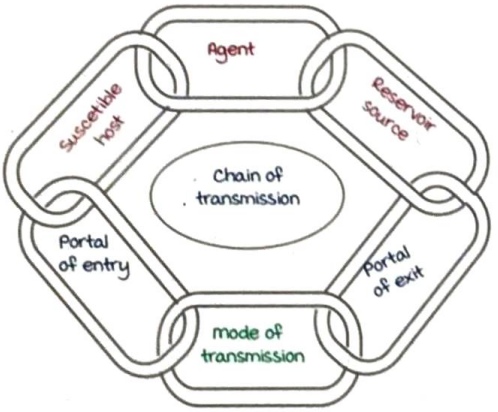
Chain of transmission

00:32:44

60c6b3eeaa8ded0e4e7e5ea7

Agent and host interaction requires Source/case/reservoir/vector.

Chain of transmission is given by Ottawa school of public health and Ottawa charter of public health.



Component	Breaking chain of transmission
Infectious agent	Disinfection, sterilization, antimicrobials.
Reservoir	Engineering measures, food/water storage, hygiene.
Portal of exit	Hand hygiene, waste disposal, case isolation.
Mode of transmission (weakest link)	Environmental sanitation, hand hygiene, PPE, disinfection, sterilization.
Portal of entry	Aseptic methods, wound care, PPE, catheter care, hand hygiene.
Susceptible host	Immunization, nutrition, management of risk factors, vaccination.

Active space

INFECTIOUS DISEASE EPIDEMIOLOGY : PART - 2

Agent determinants 00:01:18

- Infectivity : Ability of an agent to invade, multiply and develop within a host.
- Antigenicity : Ability of an agent to induce local immune response.
- Pathogenicity : Ability of an agent to invade, multiply in host and lead to cause any abnormal functioning or signs and symptoms of disease.
- Virulence : Ability of an agent to invade, multiply and cause severe disease or death or fatality. It is the Killing power of a disease. It can be found using case fatality rate (CFR).

CFR = (No. of deaths due to a disease/ total no. of cases same disease) x 100
It doesn't depend on time.
It is measured by proportion.

Host determinants 00:07:01

- Obligate host : Only host.
  e.g., Humans are obligate hosts in typhoid and measles.
- Primary host : Aka definitive host.
  Typical feature is sexual maturation happens in primary host.
- Secondary host : Aka intermediate host.
  No sexual development.
- Dead end host : Similar to obligate host.
  No person to person transmission.
  e.g., Japanese encephalitis, rabies, plague, tetanus.

	Primary host	Secondary host
Filaria	man.	mosquito (Culex).
Malaria	mosquito (female anopheles).	man.
Tapeworm	man.	Pig (T. solium), Cattle (T.saginata).
Guinea worm	man.	Cyclops.
Hydatid disease	Dog.	Sheep, cattle, man.
Sleeping sickness	man.	Tsetse fly.

Reservoir : Natural habitat of infectious agent where they multiply and develop.

Source : Any living or non living entity which harbors the infectious agent & also transmits. may/maynot be a reservoir.

Disease	Reservoir	Source
Typhoid fever	Case or carrier (man)	Unsafe water and food
Pandemic influenza	Pigs and ducks	-
Chlamydia	Pigeons	-
Histoplasmosis, Ornithosis, Arboviruses	Wild birds	-
Tuberculosis	Man	Sputum
HIV/AIDS	Man	Body fluids and secretions
Malaria	Man and mosquito.	Infected blood
Rabies	Dog and other animals.	Saliva
Measles	Man	Droplets
Japanese encephalitis	Pig and birds	Infected mosquito
Cholera	Man	Unsafe water and food
Plague	Rodents	Infected flies
KFD	Monkey	Hard tick
Hookworm	Man	Soil contaminated with infective larvae
Tetanus	Soil	Soil

In JE :

Pigs : Amplifying host.

Birds : Maintenance host.

Both act as reservoirs.

Cases

00:16:50

Risk factors → Disease & pathology → Signs and symptoms

↓

Transmission.

60c6b3eeaa8ded0e4e7e5ea7

Clinical case : Disease present, signs and symptoms present.

Sub clinical case : Disease at sub optimal level, no signs or symptoms.

Latent infection : Disease pathology ±, but infectious agent is present in dormant state, no signs or symptoms. Donot transmit.

Carrier : Infectious agent present but not in dormant state, disease pathology present, no signs or symptoms. Transmits.

Transmission : Clinical case, subclinical case & carrier.

Clinical case :

Index case : 1st observed case in a community.

Primary case : 1st case in a community (may be under observation and with or without investigation).

Secondary case : Subsequent cases which arise from primary cases within one incubation period.

Measurement of disease event

00:23:02

$$\text{Attack rate} = \frac{\text{Total no. of cases in an area}}{\text{Total susceptible population}} \times 1000$$

No definitive number of multiplication factor.

$$\text{Secondary attack rate} = \frac{\text{Total no. of secondary cases in an area}}{\text{Total susceptible population} - \text{primary cases}} \times 100$$

Unit : Percentage.

Proportion of number of secondary cases which arise within one incubation period.

Active space

Clinical scenario :

100 students were registered in a school, out of which 60 children were completely immunized. On 10th may a child reported fever and rash.

On subsequent case taking, she reported same symptoms for her friend who got sick in school on 8th may.

Following the investigation, 6 more cases of measles were reported to the public health officer on 20th may.

Solution :

Total = 100 children.

60% immunized & 40% unimmunized.

Susceptible population = 40%

$$\text{Attack rate} = \frac{8}{40} \times 1000$$

AR = 200 / 1000 cases.

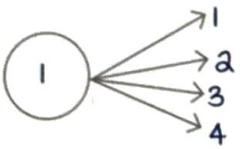
$$\text{SAR} = \frac{6}{40 - 2} \times 100$$

SAR = 15.7%

Basic (effective) reproduction number (BRN) : R_0

Similar to SAR.

Number of absolute new cases which arise from a single case.



BRN = 4

BRN has no unit and it is neither a rate nor a ratio.

It is a number.

- Not applicable to general population.
- Has to be interpreted with caution.

Effective reproduction number (R or R_e) : Total number of new cases which arise from a single case with adjustment for density, immunity and susceptible population.

Herd immunity

00:34:53

R or R_e :

$= 1 \rightarrow$ Endemic.

$> 1 \rightarrow$ Epidemic.

$< 1 \rightarrow$ Disease can die out.

To reduce R_e to < 1 :

Total population

↓

Interventions (vaccines/drugs).

↓

Can't spread disease.

↓

Chance of spread of disease to susceptible population decreases.

↓

For protection of susceptible population : Particular level of immunization is required for a particular vaccine or drug.

Example :

In a population of 1000, 800 are vaccinated and 200 are not vaccinated.

Out of 200 non vaccinated, 1 gets the disease.

Chance of 1 spreading disease to 199 is less because 800 vaccinated blocks its transmission.

In case, 950 are vaccinated in a population of 1000.

Chance of 1 non vaccinated spreading 49 non vaccinated is very very less.

Herd immunity is the inverse of reproduction number.

$$H_i = 1 - \frac{1}{\text{Effective Reproduction number}(R_e)}$$

Herd immunity : Phenomenon where non immunized population is protected from a disease by virtue of magnitude of the immune population.

Active space

Carrier stages

00:40:00

Carrier : Harbours the infection and can transmit the disease.

Incubatory carrier : Person transmits during incubation phase.
Convalescent carrier : Transmits during convalescence phase (during recovery period).
Chronic carrier : Able to transmit for more than 3 months.
Healthy carrier : Arises from a sub clinical case or from a non virulent or weak strain.

Incubatory carriers
• Diphtheria. • Measles. • Mumps. • Polio. • Pertussis. • HBV. • Influenza.

Convalescent carriers
• Diphtheria. • Typhoid. • Cholera. • Dysentery. • Pertussis.

Chronic carriers
• Malaria. • Meningitis. • Typhoid. • Dysentery. • HBV. • Gonorrhoea.

Healthy carriers : Community Medicine DPT (mnemonic)
• Polio. • Typhoid. • Cholera. • Diphtheria. • Meningitis.

Active space

INFECTIOUS DISEASE EPIDEMIOLOGY : PART - 3

Modes of transmission

00:00:40

Agent > Source > Mode of transmission > Host.

Modes of transmission :

- Direct.
- Indirect.

Direct	Indirect
• Droplet • Transplacentral • Inoculation • Contact • Soil	• Fomite • Airborne • Vehicle borne • Unclean hands • Vector borne

Transplacental/vertical transmission :

Mother to child transmission.

Examples involve:

1st trimester : Rubella virus, chicken pox.

2nd trimester : Parvo virus.

3rd trimester : CMV, hepatitis B, syphilis, toxoplasmosis.

During delivery : HIV, hepatitis C, herpes.

Inoculation :

- Direct on skin surface.
- Examples : Thorn (mycosis) or needle prick injuries (Hep B, HIV), animal bites (rabies).

Contact :

Disease due to direct touch like, scabies, dermatitis.

Disease spreads due to very close proximity/overcrowding.

Soil :

Soil is a reservoir for many disease causing organisms.

Example : Soil transmitted helminthic infections, tetanus.

Fomite :

Anything inanimate and non living things are called as fomite.

Example : Pen, table.

Can act as vector for diseases, if contaminated.

Vehicle borne :

Diseases that are water borne (gastroenteritis, cholera, typhoid), food borne (gastroenteritis, typhoid), blood borne (hepatitis, infections).

Droplet :

- Droplets travel <30-60 cm and usually causes respiratory infections.
- These droplets don't stay in the air for long and are larger than droplet nuclei.
- Diseased person should be in close proximity to be infective.

Airborne :

- Droplet nuclei are the dried residue of a droplet.
- These stay in the air for a longer period and travel 100's of meters.
- Airborne mode of transmission diseases :
  Chickenpox, measles, influenza, COVID, tuberculosis.

Vector borne

Sources :

	Vector	Life cycle
Type 1	Malaria	Human – Arthropod – Human
	Schistosomiasis	Human – snail – Human
Type 2	Plague	Rat – Ratflea – Human
	Jap. encephalitis	Birds/pig – Mosquito – Human
Type 3	Diphyllobothrium latum	Human/animals – Cyclops – Fish – Human
	Clonorchis sinesis	Human/animals – Snail – Fish –Human
	Paragonimiasis	Human/animals – Snail – Crab/Crustacea – Human

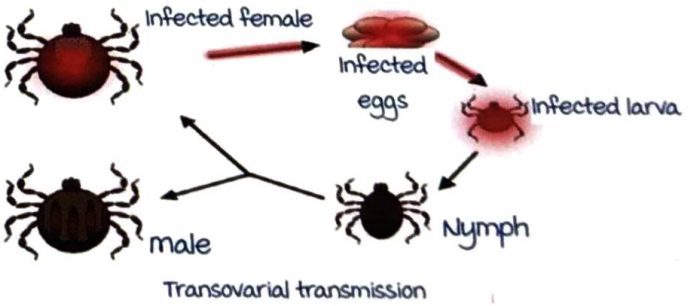
Active space

- Type 1 :
  Human to human with a vector in between.
- Type 2 :
  Zoonotic disease, the disease originates from an animal.
- Type 3 :
  Animal/human sources, and more than 1 species and vectors involved.

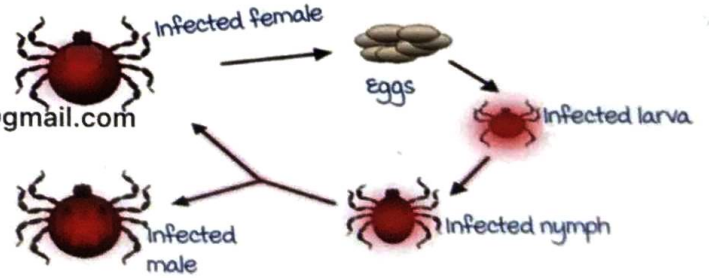
Vector transmission via :

- Mechanical transmission
  Example : on the body/footpad of housefly.

- Biological transmission
  1. Propagative :
     Change in number (multiplication) of agent in vector.
     Example : Plague.
  2. Cyclo-developmental :
     Change in shape, form or stage of microorganism after entering the vector.
     Example : microfilaria in culex.
  3. Cyclo-propagative :
     Cyclical and propagative change, i.e., change in shape and number.
     Example : Plasmodium in female anopheles.



Transovarial transmission



Transstadial transmission

Transovarian and transstadial transmission :

- Transovarian :

  Infected parent gives rise to infected offspring.

  Infected tick ⟶ Egg ⟶ Infected larvae.

  60c6b3eeaa8ded0e4e7e5ea7

  Example : Kyasanur forest disease (KFD).

- Transstadial :

  An infected adult cannot give rise to an infected offspring.

  This sort of transmission is most commonly seen in infectious diseases.

Summary :

Vehicle borne	Vector borne	Droplet nuciei	Dust	Fomite borne	Unclean hands
Acute GE, cholera, polio, food poisoning, malaria, syphilis, hep B	Dengue, KFD	TB	Coccidiomycosis	Diphtheria	Typhoid
Food	Fish tapeworm disease	Varicella	Staph, TB	Typhoid	Dysentery
water	Schistosomiasis	measles	Q fever	Dysentery	AGE
Blood		Influenza		Hepatitis A	Staph/ strep
Other				Skin infections	

Contact	Soil	Droplet	Inoculation	Vertical
STD/AIDS	Tetanus	Respiratory infection	Rabies	TORCH
Leptospirosis	mycosis		Hepatitis B	syphilis
Leprosy	STH			Rubella
Skin/eye infection				Varicella

Timings in infection spread 00:22:58

Incubation Period :

Time between entry of organism to the first sign and symptom.

Generation Time :

Time from entry of organism to maximum communicability of infectious agent.

Generation time determines the period of communicability.

Serial Interval :

Average time difference between the primary and secondary case. This is similar to median incubation period.

Isolation :

Done for cases, to decrease communicability. It is done for maximum generation time/ period of communicability. It is primary prevention.

Disease	Incubation period
Chickenpox	10 – 21
measles	8 – 14
Roseola	9 – 10
Rubella (German measles)	14 – 21
Influenza	1 – 3
most URTI (cold, bronchiolitis etc)	2 – 5
most diarrhoea (bacterial, viral)	1 – 5
Giardiasis	7 – 28
Hepatitis A	15 – 50
Fifth disease (Erythema infectiosum)	4 – 14
Hand, foot, and mouth disease	3 – 6
Impetigo (streptococcus or staphylococcus)	2 – 5
Lice	7
Scabise	30 – 45
COVID-19	3 – 12 days

Quarantine :

For apparently healthy individuals. To prevent the disease spread. This is a primary prevention.

Done for the maximum incubation period.

Disease	Duration of isolation
Chickenpox	Until all lesions crusted; usually about 6 days after onset of rash
Measles	7 days after onset of rash
Cholera, Diphtheria	3 days after tetracyclines started, until 48 hours of antibiotics (or negative cultures after treatment.
Shigellosis, Salmonellosis	Until 3 consecutive negative stool cultures.
Hepatitis A	3 weeks of onset
Influenza	3 days after onset
COVID	14 days
Tuberculosis, (sputum +)	Until 3 weeks of effective chemotherapy
Herpes zoster	6 days after onset of rash
Mumps	Until swelling subsides
Pertussis	4 weeks or until paroxysms cease
Meningococcal meningitis Streptococcal Pharyngitis	Until the first 6 hours of effective antibiotic therapy are completed

Steps in investigation of epidemic :

1. Verification of diagnosis.
2. Confirmation of epidemic (>80%/ >+2 SD).
3. Defining population at risk. } most important steps.
4. Rapid search for cases. }
5. Data analysis. }
6. Formulate hypothesis. } To control the outbreak.
7. Test hypothesis. }
8. Evaluate ecological factors.
9. Further investigation for risk.
10. Report writing and dissemination (most important step to prevent further outbreaks).

Infection control/PPE/airborne precautions 00:34:25

Contact precautions : The minimum precautions to be done to keep ourselves safe from diseases.

Example : Wearing gloves, handwashing.

Condition	Precautions
Abscess, Diarrhoea, vomiting, hepatitis, pregancy, general OPD	Contact/droplet
Rash, fever, cough	Droplet/airborne
TB, measles, COVID, influenza, chiken pox	Airborne

Droplet precaution :

Wearing a mask prevents droplet infections.

Airborne precaution :

Wearing an N95 mask prevents airborne infections.

N represents No oil. 95 represents 95% efficiency.

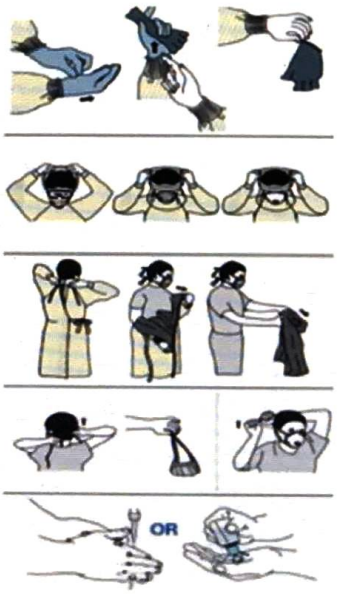
Mask without valve is safer.

60c6b3eeaa8ded0e4e7e5ea7

Donning :

Putting on the PPE. Steps according to :

CDC guidelines :	AIIMS guidelines :
Apron with shoe cover. Wear mask (lower string done first). Head cover. Face shield. Gloves.	Wear gloves Apron with shoe cover. Wear mask. Lower string tied 1st. Head cover. Face shield. Second set of gloves



Doffing.

Donning.

Active space

Doffing :

CDC guidelines :	AIIMS guidelines :
1. Take off gloves. 2. Take off face shield. 3. Take off gown. 4. Mask taken last. Lower string taken off first.	1. Disinfect hands and body. 2. Take off shoe cover. 3. Disinfect and remove outer gloves. 4. Take off face shield. 5. Disinfect and take off gown. 6. Take off inner gloves. 7. Use fresh pair of gloves to remove face mask. 8. Hand wash.

Handwashing 00:46:28

Done every time in suspected contact with patient.

Handwashing done for a minimum of 20 secs.

Mnemonic for handwashing steps : SUMMIT

Seedha : Front.

Ulta : Backside of hand.

Mutthi : Fist.

Angootha : Thumbs.

Nakhun : Nails.

Kalai : Wrist.

Active space

BASICS IN EPIDEMIOLOGY

Basics in epidemiology 00:01:45

Dr. John M Last gave the definition of epidemiology in 1988 and iceberg phenomenon.
"Epi" : Among, "demos" : Population, "logos" : Study.

Aims of epidemiology :

- To determine the incidence/ prevalence of a disease in the community.
- To determine the associated/ causative factors.
- To understand how to prevent/ control the disease.

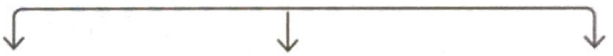
Definition of epidemiology :

60c6b3aeaa8ded0e4e7e5ea7

A study of distribution and determinants of health related states/ events and measures to control or prevent the disease.

Distribution → Descriptive studies.
Determinants → Analytical studies.
measures to control/ prevent the disease → National Health Programme.

Tools of measurement 00:08:48



Ratio :
Numerator and denominator are of different population.

Rate :
- Numerator is part of the denominator.
- Expressed in terms of time.
- multiplicative factor is 1000, 10000.

Proportion :
- Numerator is part of the denominator.
- Expressed in terms of percentage.
- multiplicative factor is 100.

Active space

Maternal Mortality Ratio (MMR) :

$$MMR = \frac{\text{No. of maternal deaths}}{\text{Total no. of live births}} \times 100{,}000$$

Maternal Mortality Rate :

$$\text{MM rate} = \frac{\text{No. of maternal deaths}}{\text{Total no. of WRA}} \times 100{,}000$$

WRA : Women in reproductive age group.

Incidence : Number of new cases in a particular time period. It is expressed as rate.
Prevalence : Number of new cases + old cases.
Prevalence is mostly expressed in percentage as it is a proportion.

$$\text{Case fatality rate} = \frac{\text{No. of deaths due to a condition}}{\text{No. of cases of same condition}} \times 100$$

CFR is a proportion & not rate.

Measures of morbidity

00:19:47

morbidity : Illness/ sickness/ disease.
morbidity can be measured as incidence or prevalence of disease.

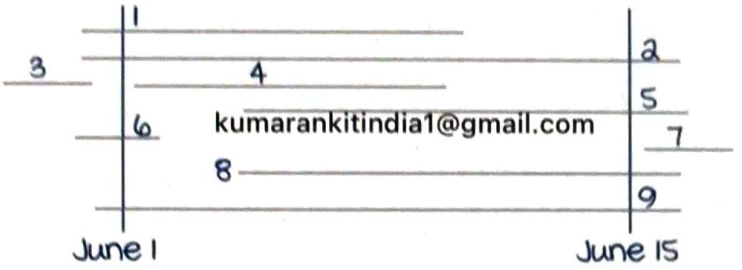
Incidence (rate) : Total number of new cases per unit time in a defined population.
Prevalence (proportion) : The total number of all cases in a defined population. Usually expressed per 100 population.

If there is a better cure for a non communicable disease : Prevalence decreases, incidence remains the same.

If there is a better cure for a communicable disease : Prevalence and incidence both decreases. Incidence decreases as development of new cases is dependent on the number of old cases.

Prevalence = Incidence x duration.

Special prevalence rates : Point prevalence → At a given time.
Period prevalence → Within a given time range.



In this example :
Period prevalence is 7 out of 9 cases.
Point prevalence on June 1st : 4 cases

Special incidence rates :

- Attack rates :

$$\frac{\text{Total no. of new cases in a given time in a population}}{\text{Total susceptible population}} \times 1000 \text{ (multiplicative factor can vary)}$$

- Secondary attack rates (SAR) =

$$\frac{\text{Total no. of secondary cases}}{\text{Total susceptible population} - \text{primary cases}} \times 100$$

Secondary cases are the ones which arise from primary cases within the incubation period.
SAR is always in percentage as it is a proportion.

Measures of mortality 00:35:39

mid year population : Population taken from 1st July to 30th June every year.

- Crude death rate = $\frac{\text{Total no. of deaths}}{\text{mid year population}} \times 100$

- Cause specific death rate = $\frac{\text{Deaths due to specific cause}}{\text{mid year population}} \times 1000$

Active space

- Proportional mortality rate = $\frac{\text{Deaths due to a certain disease}}{\text{Total deaths}} \times 100$
- Case fatality rate (CFR) = $\frac{\text{Deaths due to a certain disease}}{\text{Total cases of that disease}} \times 100$

CFR is a proportion. Always expressed in percentage.
Does not account for time.
CFR is an indicator of virulence (killing power) of a disease.

Survival rates :

- Case Survival Rate (CSR) = $\frac{\text{No. of survivors of a certain disease}}{\text{Total cases of that disease}} \times 100$

CSR = 100 − CFR.

Life table analysis : Ideal method to measure survival rates.
Kaplan Meier survival analysis : Statistical measure to ascertain survival. Helps in measuring the prognosis.

Standardization 00:41:18

Standardization is used to compare death rates in two populations with different age composition.

Types :

- Direct : When Age Specific Death Rates (ASDR) of the comparing populations are available.
- Indirect : When age specific death rates of comparing population are not available.

In indirect standardization, we calculate SMR.

Standardized Mortality Ratio (SMR) : $\frac{\text{Observed deaths}}{\text{Expected deaths}} \times 100$

SMR > 1 : Study group being assessed has high risk.
SMR < 1 : Study group being assessed has low risk.

Eminent personalities and landmark studies 00:49:09

- Father of medicine : Hippocrates.
- Father of Epidemiology : John Snow (Natural experiment on cholera).
- Father of Public health : Cholera.
- Founder of Epidemiology : Fracastoro.
- Father of Immunology/ vaccination : Edward Jenner.
- Founder of Evidence based medicine : Gordon Guyatt.
- Father of Evidence based medicine : David Sackett.
- Father of Indian Surgery : Susruta.
- Father of Homeopathy : Samuel Hahnemann.

- Germ theory : Louis Pasteur.
- Vaccination term : Edward Jenner.
- Web of causation : Macmahon.
- Multi factorial disease causation : Pattenkofer.
- Criteria of causality : Hill's criteria.

60c6b3eeaa8ded0e4e7e5ea7

Landmark research studies :

- Vitamin C and Scurvy : James Lind.
- DVT/ Breast cancer and OCP : Doll & Hill.
- Macrovascular and microvascular long term complications in Diabetes : ACCORD study (largest cohort study).
- Largest cohort study : Framingham heart study.
- Growth charts for monitoring growth : Multi centric Growth Reference Study (MGRS).
- Largest international clinical trial to assess treatment for COVID - 19 : Solidarity trial.
- Multiple Risk Factor Intervention Trials (MRFIT) : Effect of lifestyle modifications on CAD/ IHD.
- OSLO study : Effect of smoking and lipid levels on CAD.
- Multinational Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA trial) : Assessment of many risk factors and associated factors for CVD.
- Stanford trials : Three community trial. Health education and its effect on CAD.

DESCRIPTIVE EPIDEMIOLOGY

Epidemiology methods : 2 types.

1. Observational studies (non interventional studies).
2. Experimental studies (interventional studies).

Observational studies :

Two types : Descriptive studies and analytical studies.

Descriptive epidemiology 00:01:40

Steps :

- Defining the population.
- Defining the disease : Inclusion & exclusion criteria is set.
- Describing the disease : Time, place and person trends.
- Measurement of disease.
- Comparing with known indices.
- Formulation of hypothesis.

60c6b3eeaa8ded0e4e7e5ea7

Time distribution /Time trends :

- Short term fluctuations (trends).
- Long term fluctuations (trends).
- Periodic fluctuations (trends) : Subclassified into cyclic trend and seasonal trend.

Short term fluctuations :

Also known as outbreaks or epidemics.

- Outbreaks : Smaller, regional areas.
- Epidemic : Rise (sudden) in number of cases which is > 80% of expected frequency or > 2 SD.

Short term trends could be broadly of two basic types :

1. Common source (point source) epidemic : Classified into single exposure epidemic (SEPS) and multiple exposure epidemic (MEPS).
2. Propagated epidemic.

Active space

Single exposure epidemic (SEPS) :

- All the cases occur within one incubation period after a single exposure.
- Average incubation period corresponds to median incubation period.
- There is a rise in the number of cases followed by a fall.
- Only one wave is seen : Primary wave.
- Return of cases will be around one incubation period.

Multiple exposure epidemic (MEPS) :

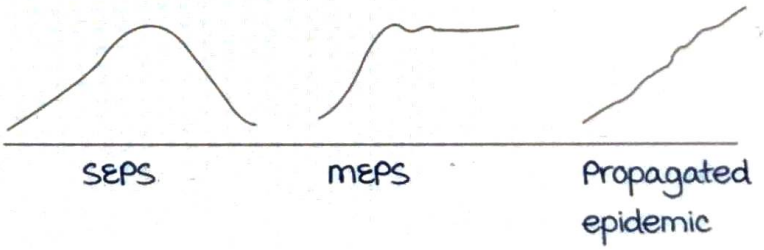
- Multiple exposure from the point source : No person to person transmission.
- Cases occur at > 1 incubation period.
- There is a rise in the number of cases but there is no fall (persistence) : Hyperendemic state.
- Secondary waves are seen.
- Example : Disease exposure from a contaminated well.

Propagated epidemic

00:11:02

- Exponential increase in number of cases. There will be an abrupt rise in the number of cases (outbreaks).
- There is person to person transmission.
- Cases occur at > 1 incubation period.
- Secondary waves are seen.

- Decline in cases is seen with herd immunity / if susceptible population is unavailable (vaccination) / decreased density of population.
- Example : COVID epidemic.



Periodic trends 00:21:02

Could be cyclic trends or seasonal trends.

Cyclic trends : Occurs in cycles.

Example : measles (every 2 - 3 years after disasters),
Rubella (every 5 - 7 years),
Influenza (every 7 - 10 years)

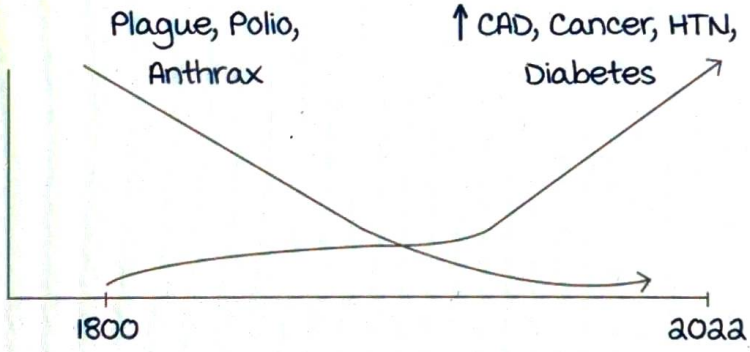
Seasonal trends : Cycles are associated with seasons.

Example :

- Summer : Acute gastroenteritis, heat strokes, dehydrations.
- Monsoon : Vector borne diseases, road traffic accidents.
- Winter : Myocardial infarction, respiratory diseases.
- Spring : Allergies, acute exacerbations of bronchial asthma, viral diseases such as chicken pox, measles.

Long term trends :

Called as secular trends (over many decades).



Secular decline in diseases such as plague, polio, anthrax.
Secular increase in diseases such as coronary artery disease, cancer, HTN, diabetes.

Place distribution :

- Some diseases could be more in rural areas : Animal bites, zoonotic diseases, fungal diseases, dermatitis.
- Some diseases could be more in urban areas : Hypertension, coronary artery disease, myocardial infarction, stroke, diabetes mellitus, cancer etc.

Active space

International variations :

Some diseases are more common in certain parts of the world.

Example :

- Cancer of the cervix, tuberculosis, diabetes mellitus are more common in India.
- Cancer of the breast / lung are more common in US / Canada.
- Stomach cancer is more common in Japan.
- Ebola outbreaks are more common in Africa (Democratic republic of Congo).
- Yellow fever is more common in African subcontinent / South America.

Yellow fever is exotic in India.

Rabies free country : UK.

National variations :

- Japanese encephalitis : Southern part of India (Tamil Nadu, Karnataka, Telangana, Kerala, Maharashtra), Uttar Pradesh, Bihar belt (Bihar, West Bengal, Chhattisgarh, Jharkhand, North East states), Punjab.
- Lymphatic filariasis : Coastal areas (Kerala, Tamil Nadu, Orissa Bihar, West Bengal), Chhattisgarh.
- Plasmodium falciparum : Northeastern states.
- Goitre : Goitre belt / Kangra belt (Himachal Pradesh, Uttarakhand).
- Kangri cancer : Jammu and Kashmir.
- Malnutrition : (Central part) Bihar, Madhya Pradesh, Maharashtra, Assam, Rajasthan, Uttar Pradesh. (Mnemonic : BIMARU).
- Drug abuse : Metropolitan cities, Punjab, few areas of northeastern states.
- Neurolathyrism : Central part of India.
- Kala Azar : (Bihar belt) Bihar, Uttar Pradesh, West Bengal, Chhattisgarh, Jharkhand.

Bihar and West Bengal are known as Kala Azar belt in India.

Person distribution

00:35:00

Based on Age :

- Diseases common in children : Pneumonia, measles (< 5 years), mumps (> 6 years / pre-school). Rubella (3 – 10 years in developing countries & > 14 years in developed countries).
- Hodgkin's lymphoma is more common at 20 years & 70 years.
- Cancer is more common in 4th / 5th decade.
- Coronary artery disease is more common after age 40.

Based on marital status :

- Married : Depression, cancer cervix.
- Unmarried : Reproductive tract infections, sexually transmitted infections, dermatitis.

Based on occupational status :

- Painter : Plumbism.
- Coal worker : Pneumoconiosis.

Based on gender :

- Males : Coronary artery disease, hypertension.
- Females : Depression, anxiety, thyroid diseases.

Based on socioeconomic status (SES) :

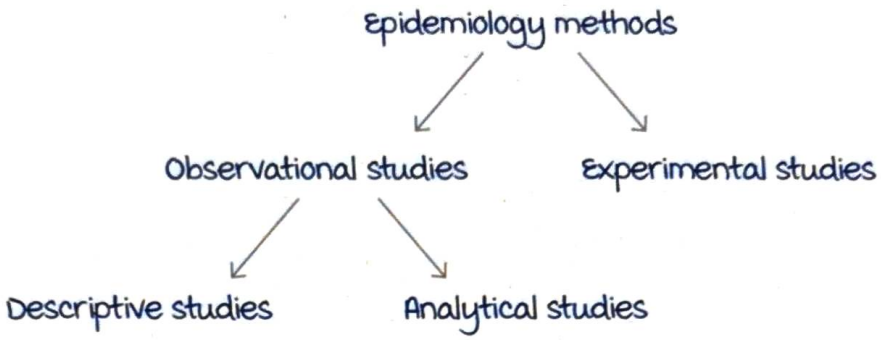
- Low SES : Dermatitis, tuberculosis, infections.
- High SES : Coronary artery disease, diabetes mellitus, cancer, parkinsonism, Alzheimer's disease.

Descriptive studies :

- Case study : Based on a single case.
- Case series : Based on multiple cases.

Active space

ANALYTICAL EPIDEMIOLOGY



Analytical study designs

00:00:22

1. Cross sectional study :
   - Study is started with total population.
   - Survey is done.
   - Prevalence.
   - Also called "snapshot of total population".

2. Case control study :
   - Study is started with disease/ non disease.
   - Also called "retrospective study".
   - From effect to cause.
   - No incidence; No prevalence.
   - Interview based study.

60c6b3eeaa8ded0e4e7e5ea7

3. Cohort study :
   - Cohort group of individuals with common characteristics.
   - Study is started with risk factors & no risk factors.
   - Also called "prospective study".
   - Follow up is done.
   - Only incidence.
   - From cause to effect.

Odd's ratio

00:19:53

- Cross product ratio.
- Calculated only in case control study.

Active space

- $\frac{\text{Logical cells}}{\text{Non logical cells}} = \frac{a \times d}{b \times c}$

Relative risk/Risk ratio :

- Relative Risk $= \frac{I\,(\text{exposed})}{I\,(\text{non exposed})}$
- Incidence (exposed) $= \frac{a}{a+c}$
- Incidence (non exposed) $= \frac{b}{b+d}$
- Calculated only in cohort studies.

Attributable risk :

- Attributable risk $= \frac{I\,(\text{exposed}) - I\,(\text{non exposed})}{I\,(\text{exposed})}$
- Calculated in cohort studies.
- It is the percentage contributed by a risk factor in causing the disease.

Population attributable risk :

- Population attributable risk $= \frac{I\,(\text{total}) - I\,(\text{non exposed})}{I\,(\text{total})}$
- Calculated in cohort studies.
- It is the % (delta) decline in the outcome variable (dependent variable) with the unit change in the risk factor variable (independent variable).

Interpretation of relative risk & odd's ratio 00:28:32

Odd's ratio = 1	Relative risk = 1	No association.
Odd's ratio > 1	Relative risk > 1	Positive association. (The assessing factor is a risk factor).
Odd's ratio < 1	Relative risk < 1	Negative association. (The assessing factor is a protective factor).

Active space

ADVANCED ANALYTICAL STUDYDESIGNS

Ecological study designs 00:00:40

- Unit of study : Population.
- Includes correlation between variables/ factors.
- Third party data source is usually taken.
- Bias : Ecological fallacy. Results of an ecological study is not applicable at individual level.

Concurrent/ non - concurrent cohort 00:06:45

Cohort : Group of people sharing a common characteristic.
Concurrent cohort : Open/ dynamic cohort or dynamic cohort. The cohort will change over time for e.g. In a study, the people may leave or enter the study at any point in time. Statistically challenging however will give better results.
Non concurrent cohort : Fixed cohort or non - dynamic cohort. Cohort is going to remain constant throughout the study. No new inclusions after the study has started.

Nested case control study 00:09:54

- Type of cohort study.
- Case control studies are done within a defined cohort group in a defined time.
- E.g. : Consider a study that began in 2022 which follows a cohort of 100
  smokers for the incidence of CAD over a period of 10 years. Suppose 10 of them developed CAD in the year 2023. Now, a case control study can be done with these 10 people as cases and other 10 people who did not develop the disease yet from the cohort as control. This is known as nested case control study.
- Advantage : 60c6b3eeaa8ded0e4e7e5ea7
  - Better results - Results from cohort and case control studies can be combined.
  - Study of choice for rare/ expensive investigations.

Retrospective cohort 00:13:14

When the investigator goes back in time (via medical records, hospital data, etc) to identify a group of people who have already had certain risk
factors and follows them up at present time to analyse the occurrence of an event.

Mixed cohort : Ambispective study.

Retrospective + prospective cohort study.

Refers to a study where a group of people with or without risk factors are identified from historical data (retrospective) and followed up from present to a time period in the future (prospective).

Cohort studies :
60c6b3eeaa8ded0e4e7e5ea7

- Prospective study.
- Retrospective study.
- Ambispective study.

Summary - analytical studies 00:18:58

	Cross-sectional	Case-control	Cohort study	Ecological study
Unit of study	Individual	Individual	Individual	Population
Also known as	Snapshot	Retrospective	Prospective	Correlational
How study is conducted	Survey of total population	Interview	Follow - up	Data resource
Outcome	Prevalence	Odds ratio	• Incidence • Relative risk • Attributable risk • Population attributable risk	Correlation of variables
Start of the study	Total population	Disease /non disease	Risk factors/no risk factors	Data matching
Bias	• Selection • Classification	Recall bias	• Attrition bias • Selection bias • Hawthorne effect • Follow up bias	Ecological fallacy

Active space

Case control	Cohort study
multiple risk factors can be assessed.	multiple outcomes maybe assessed.
Study of choice for rare diseases.	Study of choice for rare risk factors.
Less expensive.	more expensive.
Less time required.	more time required.

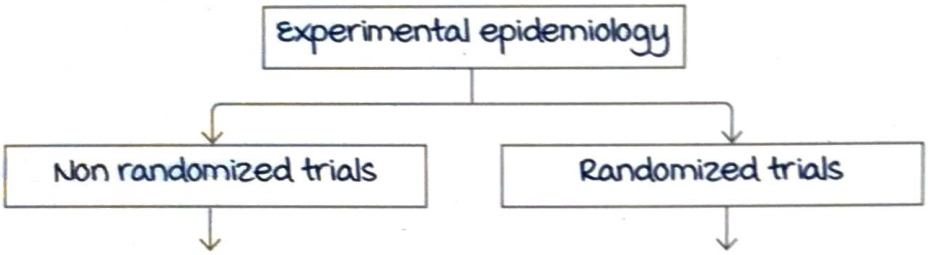
Study of choice for rare/ expensive investigations : Nested case control study (NCC).

kumarankitindia1@gmail.com

EXPERIMENTAL EPIDEMIOLOGY

Experimental epidemiology 00:00:42

Aka interventional study.
Risk factor not induced.



- Uncontrolled trials.
- Pre or post study designs.
- Natural experiments.

- Clinical trials.
- Preventive trials.
- Risk factor trials.
- Cessation experiments.
- Trial of etiological agents.
- Evaluation of health services.

Uncontrolled trials : No control group.

- Intervention launched in a population.
- e.g., IFA in a group of population for 5 years → Historical controls and results are compared based on past data.
- No controls, only datas i.e., historical controls.
- Also referred to as community trials : Intervention given in community level.

Pre or post study designs : Single group design.
Single group with defined number as sample size is taken.
Pre testing, intervention and post testing are done.
Not a community or population trial.

For e.g.,

- In a class of 100 students, community medicine test was conducted, and a majority of the students got 60% (Pre testing).

- Then lecture was conducted on community medicine (intervention).
- Again, community medicine test was conducted, and this time majority of students got >95% (Post testing).

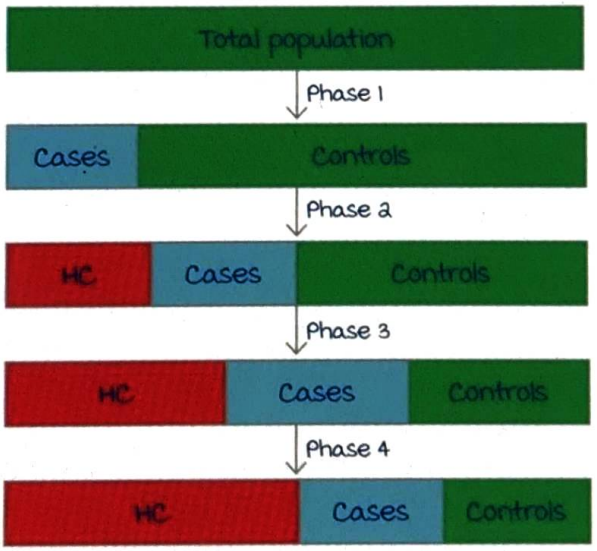
Natural experiment :
Disasters (natural or man made), natural events, etc.,
E.g., No. of cholera cases before contamination and no. of cases after contamination.
No. of cancer cases before & after the Hiroshima and Nagasaki disaster.

Randomized trials

00:07:48

Clinical trials : Drugs as intervention.

Preventive trials : Vaccine trials.
Aka step technique or step patterns.



Cases.
Controls.
Historical controls(HC).

Here, as new cases are introduced, the previous cases are taken as historical controls.

Cases : Events and complications after vaccines are checked.
Controls : Complications without vaccines are checked.
Historic controls : Old cases.

Risk factor trials :
In CAD, increased lipids is a risk factor.
Drugs for hyperlipidemia → Risk factor trials.

Cessation experiments :

Stop risk factor → Assess the chance of disease.

Assess the increase or decrease in the disease.

e.g., Smoking cessation → Increase or decrease risk of lung carcinomas.

Trial of etiological agents :

To assess the etiological agent pertaining to a disease.

For e.g.,

- It was seen that prematurely born babies had retrolental fibroplasia more commonly.
- Trials conducted with 2 groups : Babies with extra supplemental O_2 and minimal O_2.
- Extra supplemental O_2 babies → Increased incidence of retrolental fibroplasia.
- Minimal O_2 babies → Lesser incidence of retrolental fibroplasia.
- Finally, it was proved that prematurity is not the cause of retrolental fibroplasia, it is the oxygen supply given to those babies.

Evaluation of health services :

Health service to different districts as districts A, B, C and evaluate all those districts.

Randomization 00:15:02

- Removes selection bias.
- Randomization done while allocation.
- Known and equal chance.

e.g., In a clinical trial of new drugs for patients with anemia, patients are divided into 2 groups as A and B.

Group A is given the new iron folic acid combination drug and Group B is given a placebo.

After knowing Hb levels of all the cases, if very severe anemic cases are put in group A & people with normal or mild anemia are put in group B;

At the end of the trial, the group with more complications would be Group A → may lead to false assumption that iron folic acid itself is bad for treatment of anemia.
Randomization, ensures that there is equal and known chance for person with and without anemia, of getting the drug or placebo.
Also, this is why, it is done while allocation.

Interpretation of clinical trials

00:20:14

Intention to treat (ITT) analysis	Per protocol (PP) analysis
Accounted for randomization.	Not accounted for randomization.

In 200 patients with a disease, 2 different treatments are available : medical or surgical management.
After randomization, 100 patients are allotted for medical management and 100 for surgical management.
Check on complications and survival for each type of management.
This is known as Randomized clinical trials.

60c6b3eeaa8ded0e4e7e5ea7

In case : Out of 100 patients with medical management, 10 left out of the studies due to unsatisfactory results and 10 people demanded surgical management. 30 from the surgical management group joined here.
Total of 110.
15 got complications and 95 survived.

Out of 100 patients with surgical management, 20 left out of the studies as they are scared of surgeries and 30 people demanded medical management. 10 people came from medical management group joined here.
Total of 60.
10 got complications and 50 people were surviving.

Active space

Attrition (= Ran off) :
Loss to follow up.
Always accounted in clinical trials.
Maximum permissible attrition rate is 20%.
Contaminants or cross over : People who have been shuffling or shifting from one to another group.

Methods of analysis :

a. Analyze 15/110 (complications of medical management).
b. Analyze without attrition. i.e., out of 100 medical management if 11 got complications → 11/100.

Results interpretation :
To control cross over → Avoid randomization and ask patients how they intend to get treated → Intention to treat analysis (Selection bias positive).
It accounts for randomisation.

In case of the first option (15/110) → Per protocol analysis (Randomization is not accounted for).

Number needed to treat (NNT) and number needed to harm (NNH)

00:29:58

NNT : No. of cases to which the treatment must be given to avoid or avert at least one death or complication.

	Event occured	No event reported
Experimental	a	b
Control	c	d

EER : Event rate in exposed/experimental group.

$$EER = \frac{a}{a+b}$$

CER : Event rate in control group.

$$CER = \frac{c}{c+d}$$

- Absolute risk reduction = CER − EER.
- Number needed to treat = $\frac{1}{ARR} = \frac{1}{CER-EER}$

- Relative risk reduction = $\frac{ARR}{CER} = \frac{CER-EER}{CER}$

NNH : No. of patients with risk factors/interventions, needed to study, for one person to develop harmful event/ complication.

Multifactorial study designs

AKa cross over study designs.
May or may not be randomized.
But usually, RCT.

Group A (100)	Group B (100)
Atenolol	Placebo
Drug wash out period	
Placebo	Atenolol

Advantage :

- Better analysis.
- No ethical problems.

Disadvantage :

Cannot be used,

- If the drug is curative.
- If the disease is lethal.
- If the drug has long half life.

EVIDENCE BASED MEDICINE (EBM)

Definition

00:01:25

Study of the studies that reviews & consolidates all previously existing guidelines along with the experience of the researchers, clinical trials conducted, case reports.

Father of Evidence Based medicine : David Sackett.

60c6b3eeaa8ded0e4e7e5ea7

Components of evidence based medicine	
Systematic reviews	meta-analysis
Preliminary study to evaluate the effect of a factor (risk factor/protective factor) or an intervention.	Statistical approach to evaluate the final effect of an intervention or a drug or vaccine or any other factor.

meta-analysis is better than systematic review.

Steps involved in evidence based medicine :

- Formulate the hypothesis : most critical step
  Formulate a hypothesis that answers what you want to study and why you want to study.
- Identify all previous researches done on that topic.
- Extract data
- Consolidate
  — Abstraction.
- Summary estimates.
- Explore analysis.
- Publish & dissemination : Publish useful results in a reputed journal to prevent publication bias.

Levels of EBM

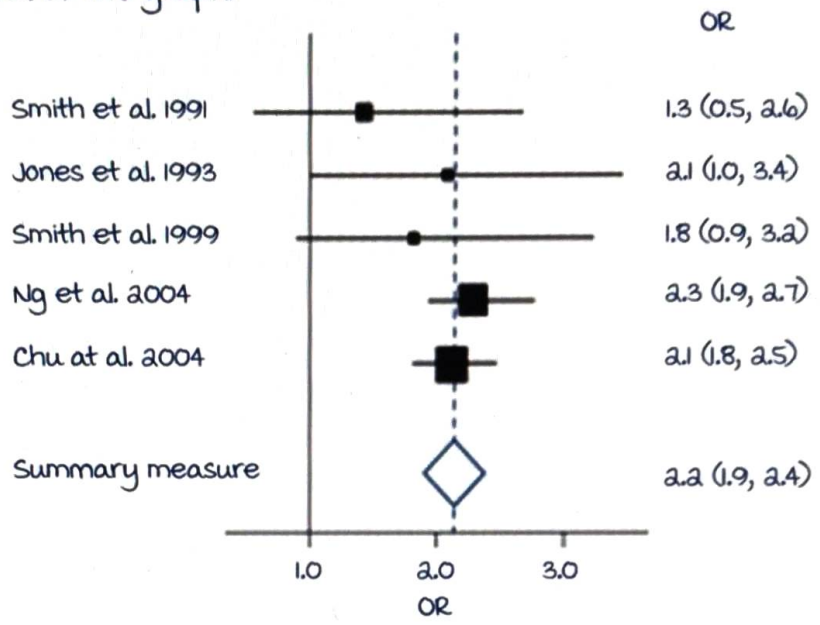
00:06:43

Level	Features
I	Experimental designs/randomized controlled trials
II	Quasi experimental designs (partial).
III	Non-randomized/non-experimental studies.
IV	Consensus panel/practice guidelines.

V	Literature reviews, case reports, opinions.

meta-analysis :
A Graph/Plot in meta-analysis is called Forest plot.

It involves plotting the median effects of various studies on a graph and determining the median (average) of the median effects indicated by the ◆ symbol (rhomboid shape) at the end of the graph.



medians of different studies with their median at the end : metanalysis

Cochrane :
Collaboration of international researchers on a common platform to share opinions, case studies and their research studies for reference.

Quaternary prevention

00:11:01

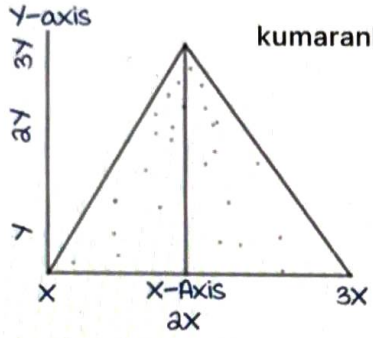
To prevent over diagnosis or over investigation or over intervention of a disease or a health related event.

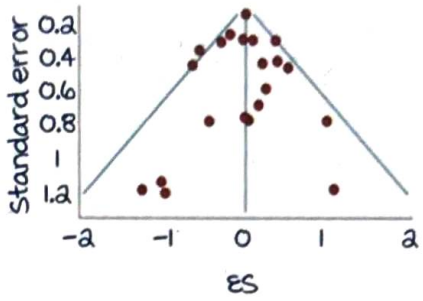
Publication bias/file-drawer effect :
Reputed organizations or journals having preferential publications.

Funnel plot :

Should always be symmetrical.

But some research studies have more effects on one side, meaning the journal is promoting one set of the results (evidence) and not the other.





Operations research : Technical term that indicates health care system research.

Used to improve health facilities, their utilization and to promote people using the system.

Surgery & clinical trials :

No chance of redoing a surgery and hence, surgical trials face huge ethical problem.

There will be high amount of non-response amongst subjects/attrition.

Quality standardization is difficult.

Deductive & inductive research 00:18:54

Deductive research	Inductive research
There is an existing established theory ↓ Formulate research questions ↓ Research to validate the theory Top-bottom approach.	Research based on a hypothesis ↓ Find the results ↓ Formulate a theory Bottom-up approach.

Active space

Qualitative & quantitative research : Qualitative is done first.

Quantitative Research	Qualitative Research
To get measurable outcomes with measurable inputs.	Group discussions & opinions to formulate a research problem.

Validity of study (to get results within a defined range) : Internal & External validity.

Internal validity	External validity
Repeated measurements/ studies in the same population to determine if it shows the same results. Corresponds to precision. Depends on the epidemiological methods used for the study or the robustness of a study design.	Generalizability of a study design. Determined by the sample size.

Guidelines of epidemiological methods 00:26:39

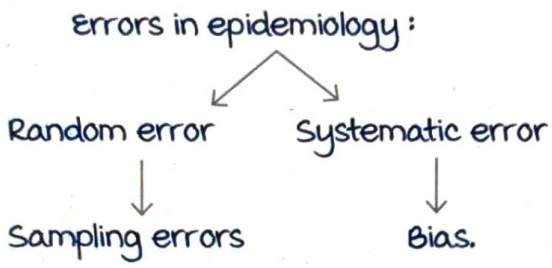
Governing guidelines	Abbreviation
Consolidated Standards of Reporting Trials.	CONSORT for experimental designs.
Strengthening the Reporting of Observational studies in Epidemiology.	STROBE for Observation.
Preferred Reporting Items for Systematic Reviews and Meta Analyses.	PRISMA for EBM
Quality control [illegible]	[illegible]
Standards for Reporting Qualitative Research.	SRQR.
Standards for Reporting of Diagnostic Accuracy.	SRDA for investigations.
Standards for Quality Improvement Reporting Excellence.	SQUIRE for any type of research method.

Active space

BIAS AND CAUSALITY

Errors in epidemiology

00:00:52



Types of bias :

Bias	Defined by
Observer bias	Differential time to the subject. Bias of the nurse, physician
Interviewer bias	Leading questions or differential level of questions.
Experimental bias	Differential procedure, device, criteria, tool to define something in different groups.
Recall bias	Specific to case control studies. Differential ability to recall between cases & controls.
Surveillance bias	Cross sectional/ any observational study. more events are observed as a result of more search.
Reporting bias	Similar to publication bias.

Important biases

00:09:13

Berkesonian bias	Differential hospital admission rates. Specific to hospital based case control studies where cases ≈ controls.
Neymann bias	Also known as incidence prevalence bias. In diseases/conditions with higher mortality. Some cases/diseases are missed due to death of the cases.
Attrition bias	Specific to cohort studies. Loss to follow up bias.
Hawthorne effect	Cohort studies or any follow up studies even in random control trials. Change in behavior while under observation.
Golem effect	Blunted effect due to unmotivated researcher.
Pygmalion effect	Exaggerated response due to aggressive, or highly motivated researcher.

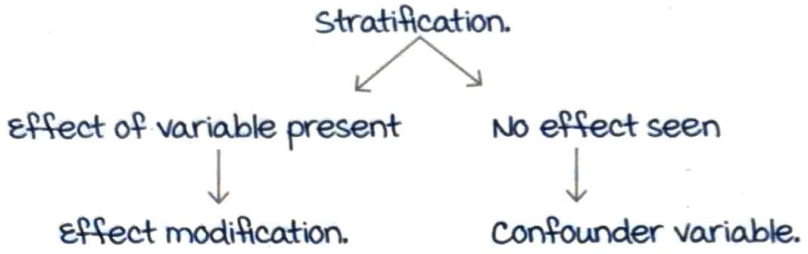
Confounding/ confounder variable

00:23:08

Associated with risk factor.
Associated with disease.
Indirect/ spurious association with disease.

Association can be
Direct : Factor being studied is a risk factor.
Indirect : A 3rd variable is helping the factor under study, to act on the disease.
Spurious : In reality, does not cause disease.

To reduce/ prevent confounding :



Treatment of bias :

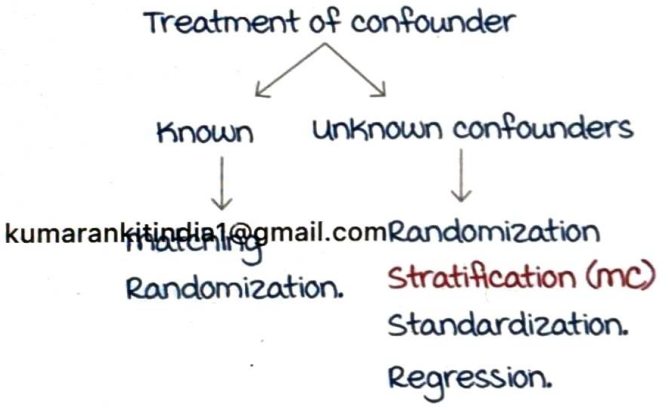
Blinding : Single : Subject is blind.

Double : Subject + doctor is blind. MC.

Triple : Subject + doctor + Analyzer (statistician) is also blind. Ideal type.

Treatment of confounder

00:29:16



Randomization : Universal treatment. Helps in removing selection bias.

Bias can be treated by both blinding & randomization.

Criteria for Causal Association/ Hill's Association :

Given by Dr. Doll and Hill.

- Biological plausibility : There should be some biological explanation.
- Specificity : The risk factor under study must cause the same disease all the time. Most difficult to establish due to multifactorial causation.
- Dose response relationship : more risk factors, incidence of disease should be more.
- Temporality : The patient must be exposed to the risk factor always before the disease. Most essential criteria.

Active space

- Coherence : The risk factor should lead to disease every time.
- Validity of investigations/ criteria/ methods used must have reasonable sensitivity or specificity and hence the results should be valid.

Summary of epidemiological studies

00:37:16

Hierarchy of causality ↓

Observational Studies	
Descriptive study	Analytical study
Case studies Case series	Cross sectional study. Case control study. Cohort study.

Experimental Studies	
Non randomized controlled trials	Randomized controlled trials

Evidence based medicine	
Systematic Review	meta-analysis

Cross sectional studies : Prevalence is found.

Case Control studies : Odd's ratio can be found

Cohort Studies :

Incidence, Relative risk(RR), Attributable risk(AR), Population attributable risk(PAR).

Best determines the natural course of a disease.

Randomized controlled trials :

Intention to treat(ITT), Per protocol analysis(PP), Number needed to treat (NNT), Number need to harm (NNH).

Meta-Analysis :

Forest plot. Best to determine causality.

most preliminary study designs: Descriptive studies that include case studies & case series.

Process	Studies involved
Formulation of hypothesis.	Descriptive studies.
Testing of hypothesis.	Analytical studies.
Validating the hypothesis.	Experimental study designs, Evidence based medicine.

Numerical Problems

00:45:34

Question 1.

Researcher conducts a case control study to evaluate the risk factors for low birth weight in 200 females attending the ANC clinic and admitted under labor room in department of gynaecology. The outcome was 100 females with low birth weight babies and another 100 females with normal (or above median) birth weight babies. The females were then asked questions based on the factors influencing pregnancy and its outcomes. The results obtained from the study :

Variable	OR	95% CI
Low fat intake	0.4	0.01 – 1.09
Low carbohydrate intake	4.7	0.8 – 9.5
High protein intake	0.5	0.01 – 0.95
Alcohol	5.6	1.2 – 9.5
Number of hours of watching TV	1.3	0.95 – 2.1
Number of hours of physical exercise	0.7	0.62 – 0.73
Stress levels	2.1	1.5 – 3.8
Smoking	5.01	4.85 – 6.3

Which of the following factors may show causal association?

Answer :

Odd's ratio > 1 indicates causal association.

However, if 95% CI range includes 1, the finding is not statistically significant.

Alcohol, stress levels & smoking are the factors that show causal association.

Active space

Question 2.

You are considering how useful a new treatment might be in preventing stroke. A well-designed study is reported with 200 patients in the treated group and 200 patients in the untreated group. The study finds a 5-year risk of stroke of 3% in the treated group versus 5% in the untreated group. Assuming this study is valid and applicable to your patient population, how many patients would you have to treat for 5 years to prevent one stroke (Number needed to treat)?

A. 500
B. 200
C. 100
D. 50

Answer : D. 50

Number needed to treat = 1/ ARR = 1/ CER − EER

$= \frac{1}{5\% - 3\%} = \frac{1}{2\%} = \frac{1}{2/100} = 100/2 = 50$

(ARR – Attributable Risk Reduction; CER – Event rate in control group; EER – Event rate in experimental group).

OR

	Treated (200)	Untreated (200)
Experimental group	6	194
Control group	10	190

ARR = 10-6/200 = 4/200.

NNT = 1/ARR = 200/4 = 50.

Active space

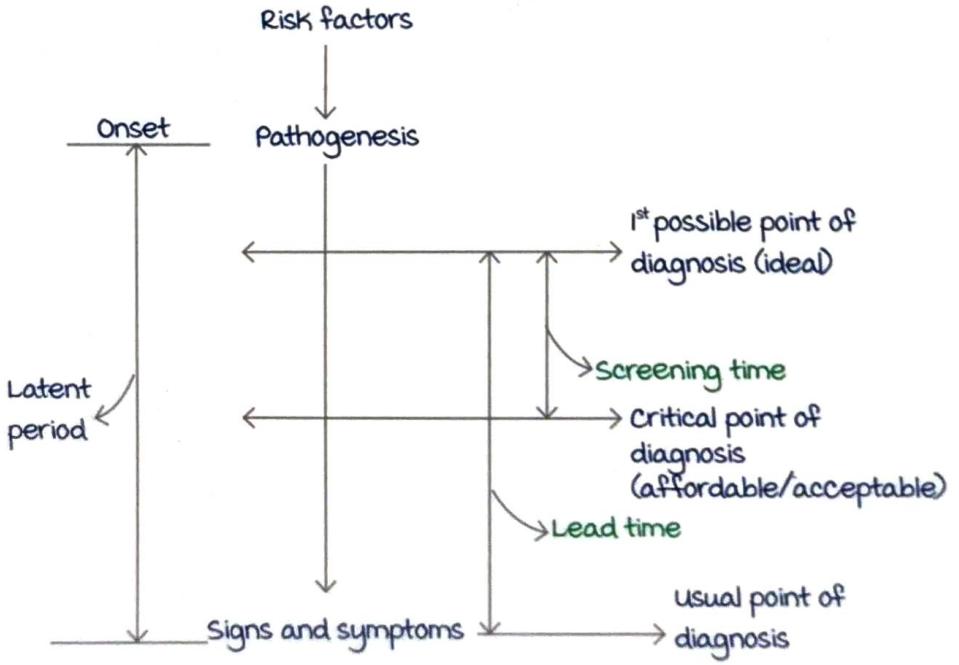
SCREENING OF DISEASE CONCEPT

Types of screening 00:01:00

Mass screening	High risk screening	Multiphasic screening
For the whole population. E.g. Screening of CA breast/ cervix, HIV.	For a certain group of population. E.g. Screening of defence people, high risk occupation, age groups.	When screening is done in steps. E.g. Questionnaire → Physical exam → Labs. or Population → Chronic cough → FEV/FVC → COPD/ asthma/others.

Prescriptive screening	Presumptive screening
Early diagnosis based on symptomatology of patient. 2° level of prevention. Examples : • Mammography for Ca breast in patient with breast lump. • Pap smear for cervical cancer in post-coital bleeding. • Fasting & post-prandial blood sugar for diabetes mellitus. • OGTT for GDM (for mother's sake).	Prevention of disease. 1° level of prevention. Examples : • HIV testing in all ANC females to prevent mother to child transmission of HIV. • HIV testing in blood donation. • Pre-employment testing. • OGTT for gestational diabetes mellitus (for sake of the baby).

Timing of screening 00:10:30



Latent period : Time from the onset of pathogenesis to first signs and symptoms.

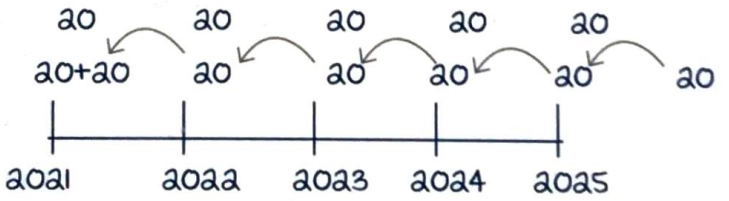
Ist possible point of diagnosis	Critical point of diagnosis
Highly interventional. Expensive. Not acceptable in society. Ideal as there may be decrease in mortality or gain in timeline.	Affordable. Acceptable. Doable in society. Optimum.

Lead time : Time difference between the 1st possible point of diagnosis and the usual point of diagnosis.
Screening time : Time difference between the 1st possible point of diagnosis and the critical point of diagnosis.
The utility of good screening tool : Long lead time & shorter screening time.

Concept of lead time

00:22:17

Example : A doctor is getting 20 Ca. esophagus cases every year. With a new test, the diagnosis can be made 1 year prior. Let's assume a lock-in period of 5 years in which the doctor was able to diagnose 100 cases in total with the older tests but could diagnose 120 cases in this same lock-in period after the new test was launched in 2021.



Let's assume in the given scenario, there was no change in the treatment or outcome.

- Increased prevalence : 120 cases (100 20 additional).
- Decreased mortality : The same no. of patients are dying but the total no. of patients increases (denominator increases).
- Increased survival rate.

Bias : Highly randomized systemic error.

Lead time bias : Virtual/apparent lowering of mortality rates (increased survival rate) for an investigation with long lead time and no change in the treatment outcomes or the absolute death rates.

Q. A new investigation is launched for cystic fibrosis, which could diagnose the disease one year earlier than the usual point of diagnosis. What is the expected outcome if the investigation was approved by authorities assuming there is no change in the treatment modality?

A. Low prevalence.
B. High survival rate.
C. High mortality.
D. No change as treatment is same.

Criteria for a screening test

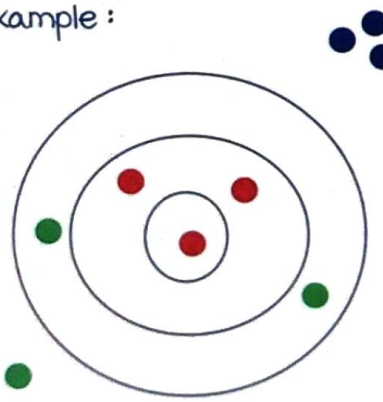
00:28:50

Affordable + Approachable/available + Acceptable.
Having reasonable validity, accuracy, precision.

Validity	Accuracy	Precision
• Getting desired results in a defined range.	• Nearness/ closeness to the actual value (true value).	• Repeatability/ Reproducibility • Getting same results persistently.

Digital instruments are highly precise.

Example :



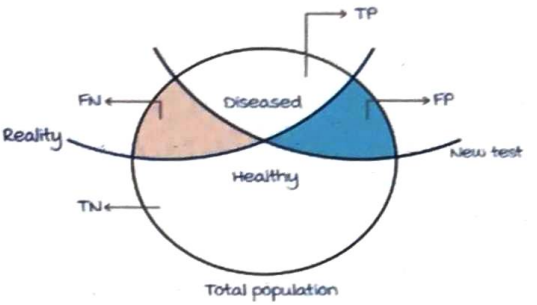
	Validity	Accuracy	Precision
Person 1	2/3	0/3	
Person 2	3/3	1/3	
Person 3	0/3	0/3	3/3

Active space

DETERMINANTS IN SCREENING OF DISEASE

Properties of screening test

00:00:27



60c6b3eeaa8ded0e4e7e5ea7

Rule #1 → Always disease on top.

Rule #2 → Never cross two sides of the table.

	D+ (disease present)	D− (disease absent)
T+ (tested positive)	TP (true positive)	FP (false positive)
T− (tested negative)	FN (false negative)	TN (true negative)

1. Sensitivity (Sn) → $\frac{TP}{TP + FN} = \frac{TP}{D+}$

2. Specificity (Sp) → $\frac{TN}{TN + FP} = \frac{TN}{D-}$

3. FP error rate → $\frac{FP}{FP + TN} = \frac{FP}{D-} = 1-Sp$

4. FN error rate → $\frac{FN}{FN + TP} = \frac{FN}{D+} = 1-Sn$

5. PPV (positive predictive value) → $\frac{TP}{TP + FP} = \frac{TP}{T+}$

6. NPV (negative predictive value) → $\frac{TN}{TN + FN} = \frac{TN}{T-}$

Active space

Increase in specificity decreases false positive error rate.
Increase in sensitivity decreases false negative error rate.

Q. What is the probability of having a person to get tested positive if he was actually having the disease?

A. Sn B. Sp C. FNER
D. FPER E. PPV F. NPV

Q. What is the probability of having a person to get tested negative if he was actually healthy?

A. Sn B. Sp C. FNER
D. FPER E. PPV F. NPV

Q. What is the probability of having a person to get tested positive if he was actually healthy?

A. Sn B. Sp C. FNER
D. FPER E. PPV F. NPV

Variant :
What is the probability of having a person to get tested negative if he was actually diseases?

60a6b3eeaa8ded0e4e7e5ea7

A. Sn B. Sp C. FNER
D. FPER E. PPV F. NPV

Q. What is the probability of a person to have a disease if he was tested positive?

A. Sn B. Sp C. FNER
D. FPER E. PPV F. NPV

Variant :
What is the probability of a person to be healthy if he was tested negative?

A. Sn B. Sp C. FNER
D. FPER E. PPV F. NPV

Active space

Sensitivity	Probability of having tested +ve, out of total diseased population.
False negative error rate	Probability of having tested -ve, out of total diseased population.
Specificity	Probability of having tested -ve, out of total healthy population.
False positive error rate	Probability of having tested +ve, out of total healthy population.
Positive predictive value	Probability of having the disease, out of total tested +ve population.
Negative predictive value	Probability of having no disease (on being healthy), out of total tested -ve population.

ADVANCED CONCEPTS IN SCREENING OF DISEASES

Screening & Diagnostic tools

00:00:27

	Disease +	Disease −
Test +	True Positive (TP)	False Positive (FP)
Test −	False Negative (FN)	True Negative (TN)

FPER (False Positive Error Rate) :

- FPER = FP / D^-
- It is related to the T_1 (Type 1) error.
- It is related to α error.

FNER (False Negative Error Rate) :

- FNER = FN / D^+
- It is related to T_2 (Type 2) error.
- It is related to β error.

The seriousness of an error : FP > FN.

- T_1 error > T_2 error.
- α error > β error.

Screening test :

- We use sensitivity (Sn).
- A test with low false negative (FN).
- E.g ECG for ST elevation.

Diagnostic/Confirmatory test :

- We use specificity (Sp).
- A test with low false positive (FP).
- E.g cardiac enzymes for STEMI.

Likelihood ratio (LR)

00:05:35

- Chance of having a disease.

	D^+	D^-
T +	TP	FP
T −	FN	TN

≈

Sn	1 − Sp
1 − Sn	Sp

Sn – Sensitivity ; Sp – Specificity

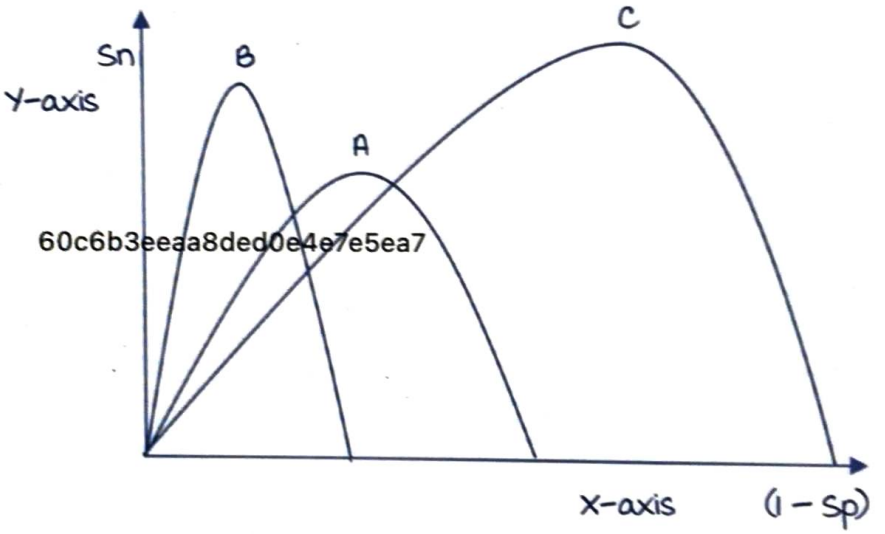
$LR^+ = TP/FP = \frac{Sn}{(1 - Sp)}$ [LR = Likelihood Ratio]

$LR^- = FN/TN = \frac{(1 - Sn)}{Sp}$

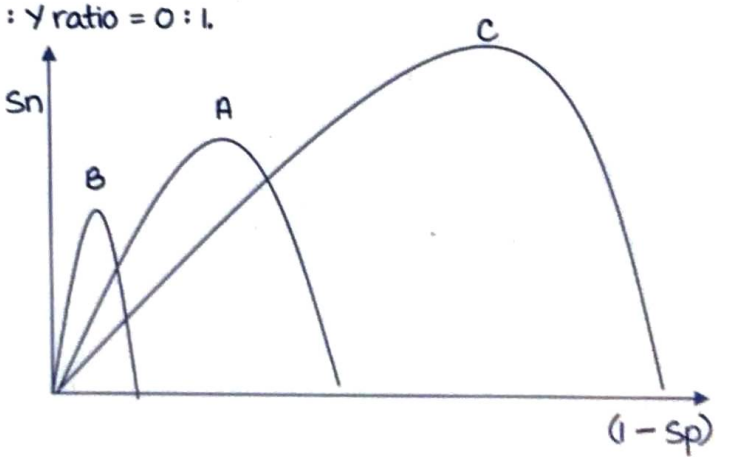
Receiver Operator Characteristic Curve (ROC) 00:11:34

Graphical representation of LR^+.

Curve between Sn and 1 − Sp.



- The best curve or best screening test is the one that has higher sensitivity & a lower false-positive rate (1 − specificity). Therefore, B is the best curve among the three curves.
- X : Y ratio = 0 : 1.



- Screening test / 1st investigation of choice = C
  Although being highly false positive, it has the highest sensitivity.
- Diagnostic test/most confirmatory test = B
  Highest specificity and least false positives.

False Positivity - Determinants

00:18:58

	D^+	D^-
T +	TP	FP
T −	FN	TN

Increase in FP by :

←

	D^+		D^-
T +	TP		FP
T −	FN		TN

- Sensitivity remains the same, as proportion of TP out of total population remains same.
- Decrease in TP.
- Low disease prevalence.

Or

	D^+	D^-
T +	TP	FP
T −	FN	TN

↓

- Decrease in TN, that is low specificity.

Therefore, high FP can be due to :

Decreased specificity > Low prevalence > Increased sensitivity.

High sensitivity maybe seen in some cases where there are differential prevalences of that disease or different categories of that disease (subclinical, carriers) where TP maybe high.

Active space

PPV calculations

00:26:56

Probability (P) :

- Chance of event.
- Expressed in decimals.

Odds Ratio :

- It is a ratio.
- Odds :

$$\frac{\text{Number of times an event is likely to happen}}{\text{Number of times an event is unlikely to happen}}$$

$$\text{Probability} = \frac{\text{Odds}}{1 + \text{Odds}}$$

$$\text{Odds} = \frac{\text{Probability}}{1 - \text{Probability}}$$

Example : The chance of throwing a number a 6 on a dice is 1/6 or 0.166... and odds ratio is 1:5

Pretest probability :

- Probability of having a disease before doing a test.
- It is the prevalence of the disease.

Post test probability :

- Probability of having a disease if the person is tested positive.
- It is the positive predictive value of the disease.

Example : The prevalence of undernutrition in our country is 20%. A new Shakir Tape has 90% sensitivity and 80% specificity for assessment of undernutrition.
What is the probability that a child classified malnourished will be malnourished in reality?

Sn = 90%, Sp = 80%, Prevalence = 20%, PPV?

1. Use prevalence to calculate Disease positive (D^+).
   Prevalence = 20, D^+ = 20.

Active space

	D+	D−	
T+	18	16	
T−	2	64	
	20	80	= 100

2. Use Sn to calculate TP

$$Sn = \frac{TP}{D^+}$$

$$TP = Sn \times D^+$$

$$= 90\% \times 20 = 18$$

3. Use Sp to calculate TN

$$Sp = \frac{TN}{D^-}$$

$$TN = Sp \times D^-$$

$$= 80\% \times 80 = 64$$

4. Calculate PPV :

$$PPV = \frac{TP}{T+}$$

$$= \frac{18}{34}$$

$$= 52.9\%$$

(Or)

Bayes Formula :

$$PPV = \frac{Sn \times Prevalence}{(Sn \times Prevalence) + [(1 - Sp) \times (1 - Prevalence)]} \times 100$$

$$NPV = \frac{Sp \times (1 - Prevalence)}{Sp\ (1 - Prevalence) + [(1 - Sn) \times Prevalence)]} \times 100$$

PPV is dependent on :

- Sensitivity.
- Specificity.
- Prevalence

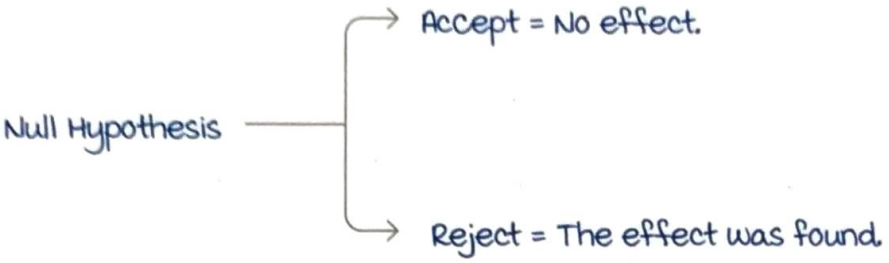
PPV is most affected by prevalence.

Active space

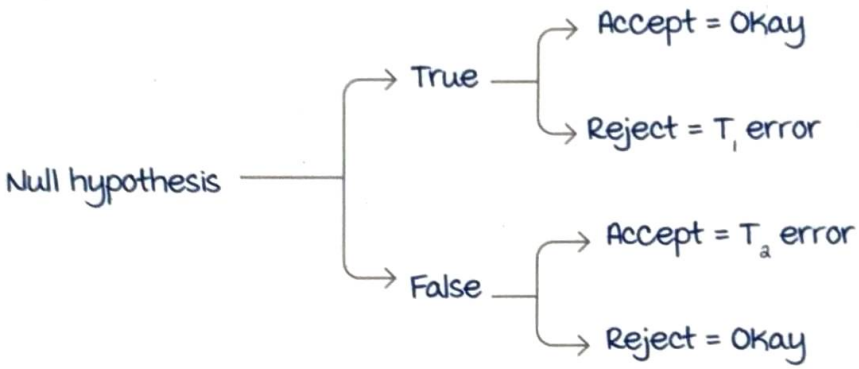
Null Hypothesis & Errors

00:42:30

- Null hypothesis means no effect or both the groups are the same.



- Null hypothesis, in reality, can be true or false.



A study was conducted to find the effect of a new drug for COVID 19 cases in hospital based 22 patient, non randomised trial. It was compared to a standard treatment regimen which showed significant improvement in the experimental group with p value 0.01 at 95% CI and relative precision of 82%. However, under laboratory conditions, the 2 drugs did not show any difference of effect. The research could have committed a :

60c6b3eeaa8ded0e4e7e5ea7

A. Alpha error.

B. Beta error.

C. False negative error.

D. No error as sample size was small.

Ans : The null hypothesisis true ⟶ Type I error.

Active space

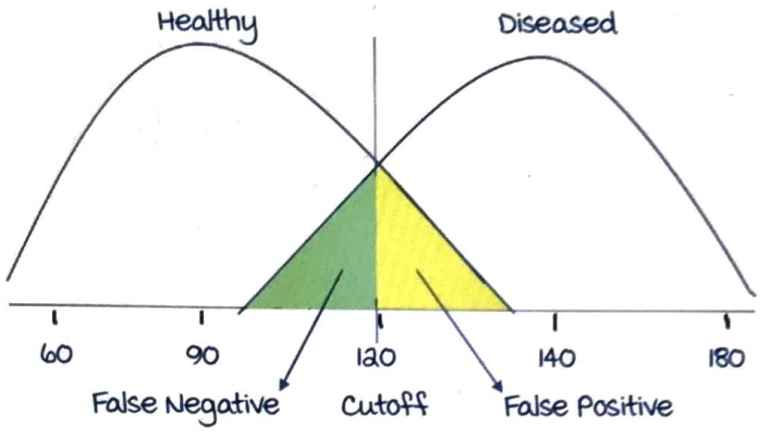
Comparing Cutoffs

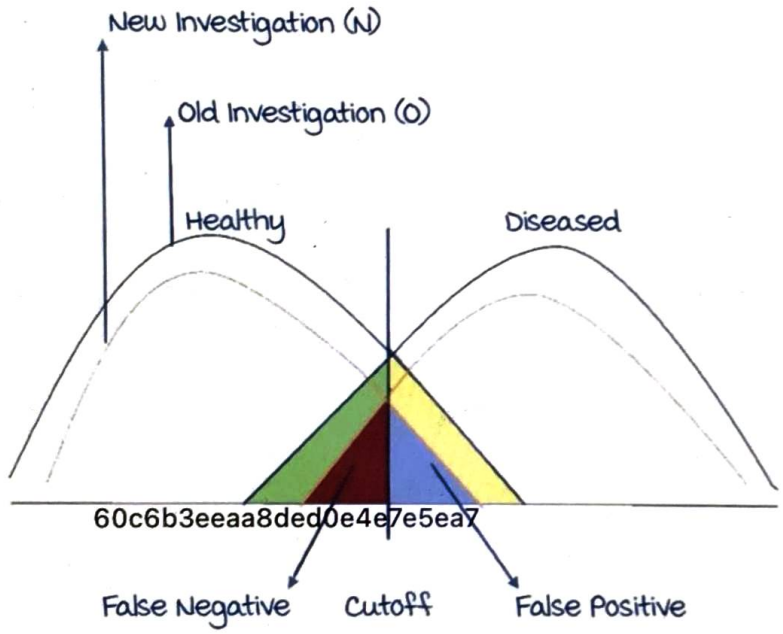
00:53:11

- For screening tests & fatal diseases, there should be a lower cutoff.

Interpretation of screening tools :

Probability distribution curve :





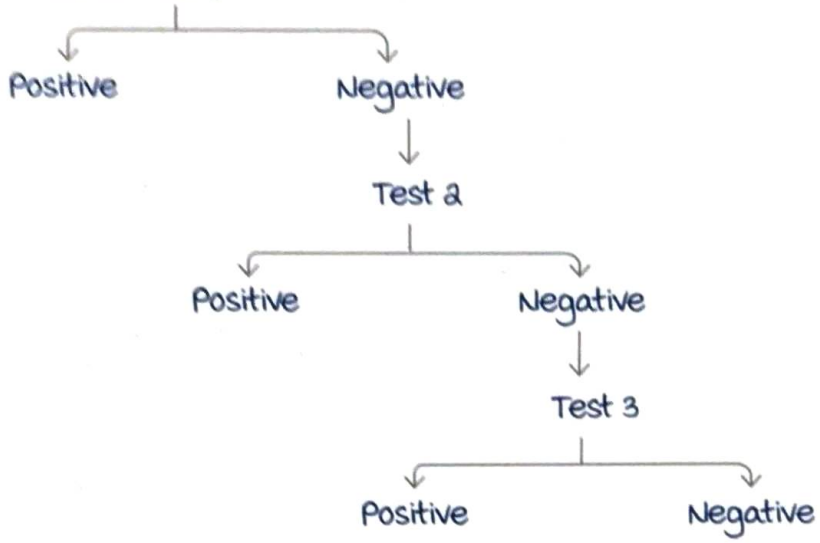
- With the new investigation, the FN & FP has decreased ($FN_N < FN_O$ & $FP_N < FP_O$).
- Therefore, new investigation has higher sensitivity and specificity.

Active space

Combination of Tests

01:03:52

- If we have test 1, test 2, & test 3 : If all the tests are done at the same time, it is called testing in parallel.
- If we do Test 1,



- It is called testing in series.

Test	Sensitivity (Sn)	Specificity (Sp)	Positive Predictive Value (PPV)	Negative Predictive Value (NPV)
Series	↓	↑	↑	↓
Parallel	↑	↓	↓	↑

Extra – edge points

01:07:22

R – Charts (Range charts) :

- Gives precision & validity of tests.
- These are reproducibility charts.

LJ charts :

- Gives accuracy & validity.
- Consists of a median line that represents the actual value, and the test findings are plotted on either side of the line based on how close they are to the actual value.
- Can also be used to determine the range.

Active space

Yield of a test :

- Corresponds to Positive Predictive Value (PPV).
- Gives the diagnostic capacity of a test.
- It is most affected by prevalence.

Diagnostic accuracy of a test :

- Diagnostic accuracy = $\frac{TP + TN}{TP + TN + FP + FN}$

Youden's Index :

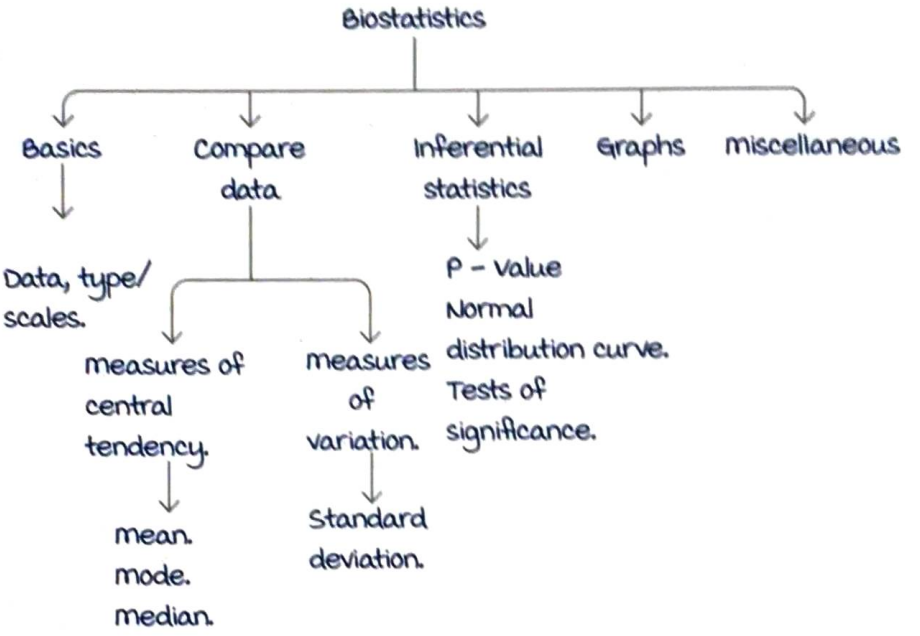
- It is a point calculated in the ROC curve.
- It determines how far the investigation is away from the baseline.
- Gives the utility of the screening tool.
- Therefore, the bigger the Youden's index, the better is the screening test.

INTRODUCTION TO DATA IN BIOSTATISTICS

60c6b3eeaa8ded0e4e7e5ea7

Uses :

- Define cut-offs.
- Understand variation.
- To present data.
- To make inference (provide evidence).



Data

00:07:54

Quantitative	Qualitative
• Continuous. • measurable. • E.g. weight, height, AST, ALT levels. • Mean of data can be calculated.	• Discrete. • Countable. • E.g. No. of people who are sick/ healthy, alive/dead. Gender. • Proportions/ percentages can be calculated.

Pulse rate is a data which is discrete and countable, however it is quantitative as we calculate its mean.

BP is quantitative data.

Active space

Scales of data

00:14:25

Nominal	Ordinal	Interval	Ratio
• Named data. • No sequence • E.g. Gender, religion, blood groups.	• Inherent order. • Has a sequence. • E.g. Stage, grade, the severity of the disease.	• Interval between two values is present. • No start point/no absolute zero. • E.g. °C, dB.	• Ratio can be calculated. • There is zero point/ absolute zero. • E.g. Na, K, FEV levels.

Interval type of data :

Example : 20 °C is not half as hot as 40 °C, but colder compared to 40 °C. Here the intensity of data is measured. Also, the temperature can go below 0 °C (in minus °C), which means there is no absolute zero.

Ratios :

Example : A weak fragile child weighs 20 Kg when the ideal weight should have been 40 Kg in the same age group. The ideal weight is 2 x child's age, which means the values can be expressed in multiples (double, triple) of each other
i.e calculation of ratios is possible.
Also, there is absolute zero/ no value below zero.

60c6b3eeaa8ded0e4e7e5ea7

Active space

MEASURES OF CENTRAL TENDENCY AND VARIATION

Measures of Central tendency

00:01:59

Mean :

1. Arithmetic mean :
   - Average = $\frac{\Sigma(\text{summation})}{n}$

2. Geometric mean :
   - Calculated in case of : Exponential data.
     Extreme values.
   - Example : Human development index
     (India = 0.647, ranked at 129 in 2019)
3. Harmonic mean :
   - Calculated in case of : Inverse data.
     Fractional values.

Advantages :

- Best measure of central tendency.
- Easiest to calculate.

Disadvantages :

- Most affected by extreme values.

Median :

Central value after arranging in ascending or descending order.

Advantages :

- Least affected by extreme values.

Mode :

The most frequently occurring value.

Mode = 3 Median − 2 Mean.

Advantages :

- The most robust measure of central tendency.
- The last to be affected by extreme values.

Data with extreme values : Preferred measure is median.
Preferred mean is geometric mean.

Measures of variation

00:14:11

1. Range :

   Range = maximum to minimum.

2. Standard deviation :

Gives the mean deviation of every value from the mean.

Formula : The root of the mean of squared deviation.

$$SD = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

In case of a small sample,

$$SD = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n - 1}}$$

$n - 1$ is the correction for the small sample ($n < 30$).

3. Variance :

   Variance (V)= SD^2

$$V = \frac{\Sigma (x - \bar{x})^2}{n}$$

4. Coefficient of variation (CV) :

   Absolute variation between 2 different populations.

$$CV = \frac{S.D}{mean} \times 100$$

5. Standard error :

Gives the error in different studies in terms of standard deviation.

Alternatively, gives the variation between values when different researches are done.

a. Standard error for mean :

- For quantitative data.
- $SE_m = \frac{SD}{\sqrt{n}}$

Active space

b. Standard error for proportions :

- For qualitative data.
- $SE_p = \sqrt{\frac{PQ}{N}}$

P : Prevalence.

Q : 100 – prevalence.

n : Sample size.

If p- value or Confidence interval is provided as input, Standard error has to be calculated and not the Standard deviation.

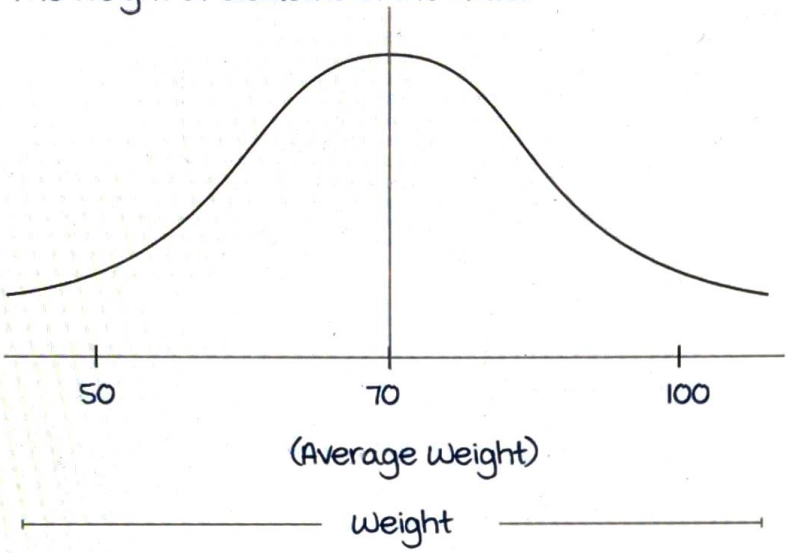
Active space

NORMAL DISTRIBUTION CURVE

Normal distribution curve 00:00:08

It represents the distribution of data in a bell-shaped curve, in a large sample.

Eg : The weight of students in the class.



Features of Normal distribution curve :

It is also known as the Gaussian distribution curve.

It is a bilaterally symmetrical bell-shaped curve.

The ends never touch the baseline.

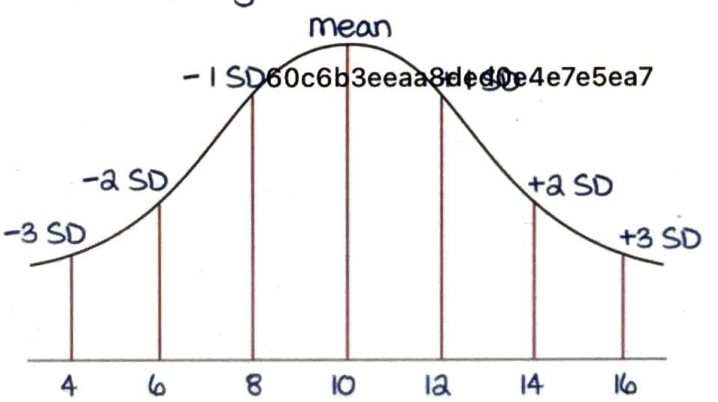
mean = median = mode → Coincide at 0 or the centrepoint.

SD = 1.

AUC = 1 (Area Under Curve), means the whole population is accounted for.

Eg : mean Hb ($\bar{x}$ Hb) at a place = 10 gm% ± 2 g%.

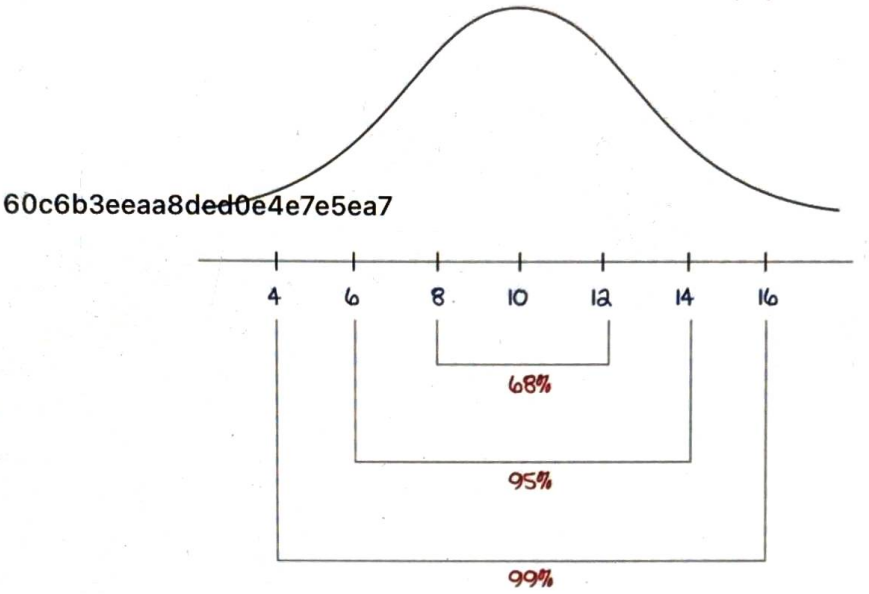
Where 1 SD = 2 g%



Assumptions in normal distribution curve : First assumption

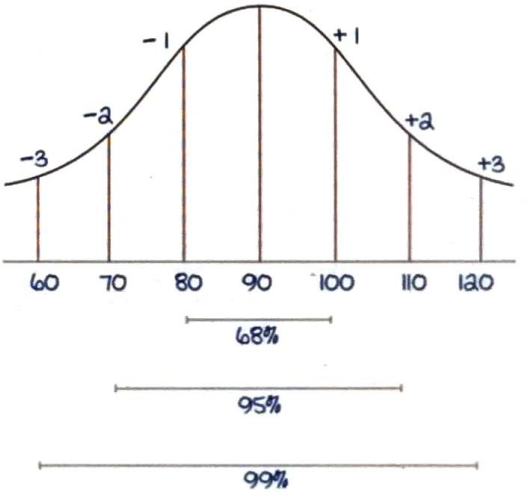
00:07:28

Between the − 1 SD and + 1 SD : 68% of the population lies.
Between the − 2 SD and + 2 SD : 95% of the population lies.
Between the − 3 SD and + 3 SD : 99% of the population lies.



Eg : mean blood glucose = 90 ± 10 SD.
How much of the population will be expected to fall between :

- 80 to 100 mg/dl = 68% population.
- 70 to 110 mg/dl = 95% population.
- 70 to 100 mg/dl = 68% + 13.5 % population [(95−68)/2=13.5]
- more than 70 mg/dl = 100 − 2.5 % = 97.5% population.
- Less than 100 mg/dl = 84% population (100−13.5+2+0.5).
- more than 100 mg/dl = 16 % population.
- Less than 60 mg/dl = 100 − 99 = 1/2 = 0.5% population.
- Less than 120 mg/dl = 100 − 0.5 % = 99.5% population.



Active space

Q. The mean blood glucose from 5929 ANC females in the state of Maharashtra was found to be 130 ± 5 mg/dl. The cut off for diagnosing GDM was kept as higher than 140 mg/dl. How many pregnant females are expected to be GDM diagnosed?

A. < 50.
B. 50 to 100.
C. 100 to 200.
D. 200 to 500.

mean = 130, +1 SD = 135, +2 SD = 140, +3 SD = 145
−1 SD = 125, −2 SD = 120, −3 SD = 115.

To be GDM diagnosed, they must belong to above +2 SD of population.

Above +2 SD = 100 − 95% (between +2 and −2 SD) − 2.5% (less than −2 SD) = 2.5%

2.5% of 5929 ~ 150 females, which falls under range of 100–200.

Second assumption : Zone of Normalcy 00:20:51

Zone of normalcy/normal zone :

Between the − 2 SD and + 2 SD = 95% of population.

Z score :

It is also called standard deviate.

It gives the location of the value in terms of the standard deviation (SD).

The cut off for Z score : ± 2 SD/± 1.96 SD.

If the Z score is > 2 : Abnormal Z score.

$$\text{It is calculated by} = \frac{\text{Observed value} - \text{Expected value}}{\text{SD}}$$

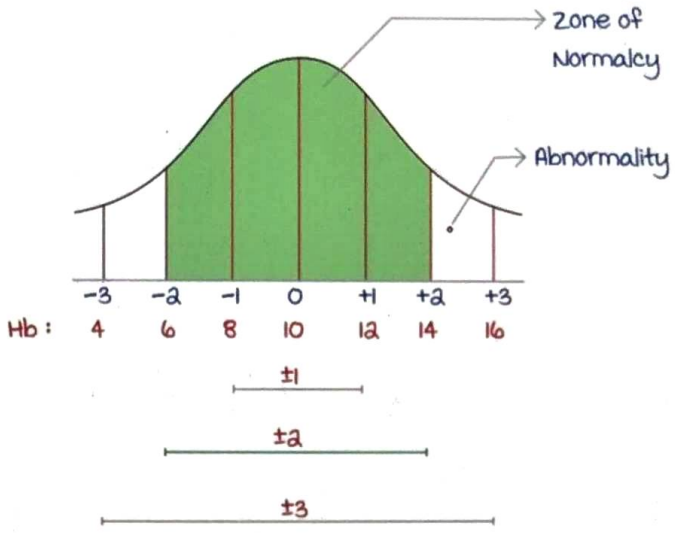
Eg : Observed value of Hb = 15 gm /dl.

Expected value (always the mean value) = 10

SD = 2

$$\text{Z score} = \frac{15 - 10}{2} = 2.5$$

Z score 2.5 : It lies 2.5 SD away from the mean.



60c6b3eeaa8ded0e4e7e5ea7

Active space

CONCEPT OF PROBABILITY VALUE

P value

00:01:05

P value :

Probability value (chance of events expressed in decimals).

Normal value ranges from 0 to 1.

0 : Lowest probability.

1 : Maximum probability.

Standard errors (SE) :

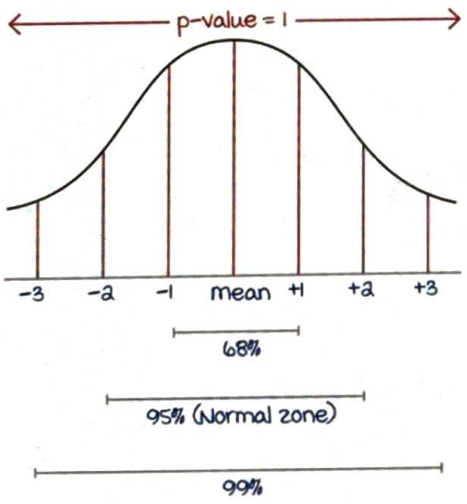
±1, ±2, ±3,...

Confidence limit/interval :

+1 to − 1 = 68% confidence interval.

+2 to − 2 = 95% confidence interval.

+ 3 to − 3 = 99% confidence interval.



In the normal distribution curve :

The highest probability is denoted as the center : 1.

The lowest probability lies on either side of the curve.

At +2 to − 2 standard deviation the P value is : 0.05 −

Zone of normalcy.

Active space

P value – abnormal zone

00:06:20

Example : Randomised clinical trial – two groups A and B

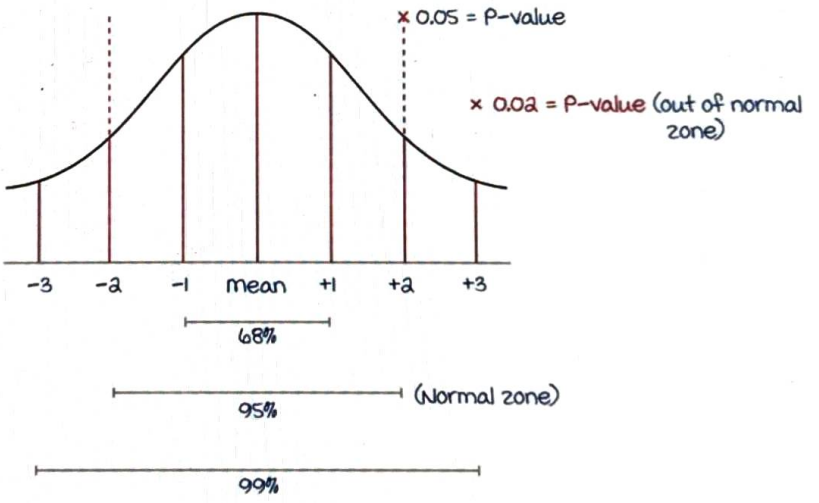
Group A → Drug is given (Remdesivir) → check A'

Group B → Placebo given (vitamin C/zinc) → Check B'

The collected data is incorporated in a machine : Gives P value.

If the P value is 0.02 : Abnormal/out of the normal zone.

P value > 0.05	P value < 0.05
Normal variant	Abnormal variant
Non-significant	significant
No effect found	Effect is found
Null hypothesis : Accepted	Null hypothesis : Rejected



P value – normal zone and changes

00:16:42

The normal zone for P value – 95% confidence interval.

Active space

If the normal zone moved from 95% to 68% :

Previously non-significant becomes significant.
Chances of finding an effect increases.
The chances of reject of null hypothesis increases.
The chances of alpha error increases.

If the normal zone moves from 95% to 99% :

Previously significant becomes non-significant.
The chances of finding an effect decreases.
The chances of accepting of null hypothesis increases.
The chances of beta errors increase.

Alpha error, type I & II error 00:23:08

Definition :
It is the probability of finding an effect (just by chance) which in reality does not exist.
It corresponds to the P value/confidence interval/limit.

Example : P value of 0.02 corresponds to α value 2%.
It means there is 2% chance of error in the study.
It also means there is 98% of confidence in the study.

68% corresponds to 32% alpha.
95% corresponds to 5% alpha.
99% corresponds to 1% alpha.

FPER : The chance of finding disease in a healthy patient.

Type I error :
Rejecting a null hypothesis, which in reality is true.

Type II error :
Accepting a null hypothesis, which is false in reality.

TESTS OF SIGNIFICANCE

Statistical mathematical formula to derive a p-value.
Determines if P-value is significant or non significant.

Types of tests of significance

00:02:59

Types

1. Parametric
   Quantitative
   Normal distribution data

2. Non-parametric
   Qualitative
   Non-normal distribution data

Parametric test	Situation	Non-parametric test
Paired 't' test.	Single group	mc nermar's test.
Unpaired 't' test A/K/A Independent sample 't' test.	Two groups	Chi square test (χ^2).
Analysis of variance (ANOVA)	Three or more groups	Kruskal-wallis test. Chi square for trend.

60c6b3eeaa8ded0e4e7e5ea7

Advance tests of significance

00:08:59

- Large sample (n > 30) = 'Z' test.
- Ordinal data : wilcoxan rank test (W/R)
  - W/R sign test — For grouped data
  - W/R sum test — For ungrouped data
- Normalcy of data : Kolmogorov smirnov test.
- Outliers : Dixon's Q test.
- Internal consistency of questionnaire : Cronbach's α score
- Compare a new test with a gold standard test : Bland altman analysis.

Active space

- Level of agreement : KAPPA test.

$$\text{Formula} = \frac{\text{Observed level of agreement} - \text{expected level of agreement}}{1 - \text{expected level of agreement}}$$

Active space

CORRELATION, REGRESSION AND SKEW

Correlation

00:00:13

Relation between 2 variables.

Scatter plots are used.

Types :

Linear

- Also known as Pearson-Karl correlation.
- Represented by : r
- Range : −1 to +1

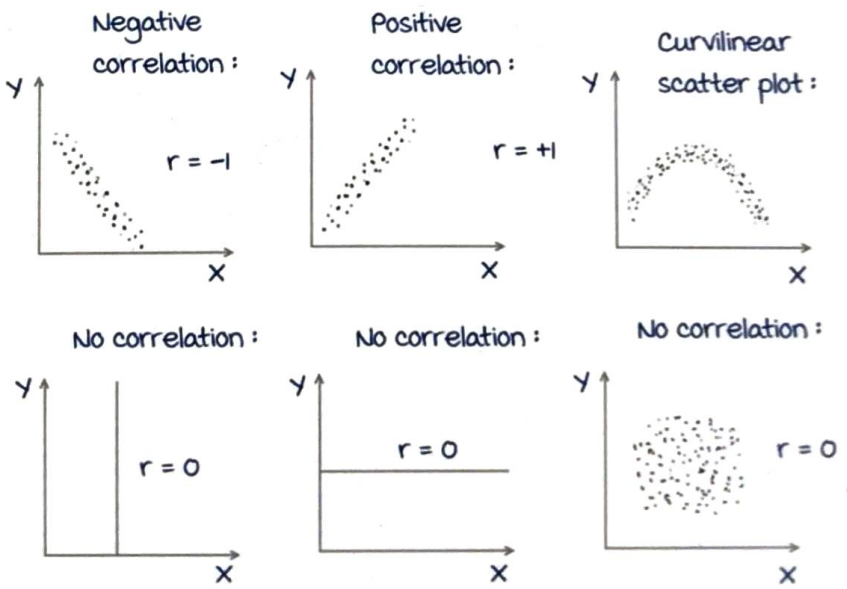
  −1 : Perfect negative correlation.

  +1 : Perfect positive correlation.

  r = 0 : No correlation.

Curvilinear

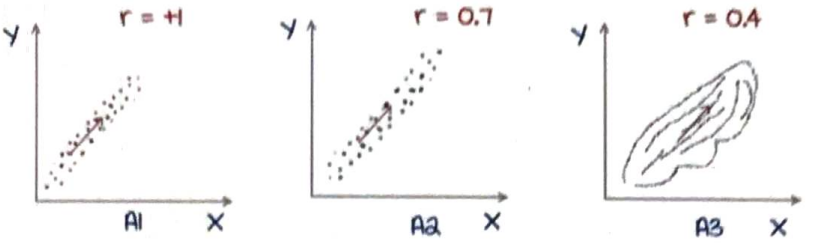
- Also known as non-linear/ Spearman correlation.
- Represented by : ρ
- Eg : Hb-O dissociation curve



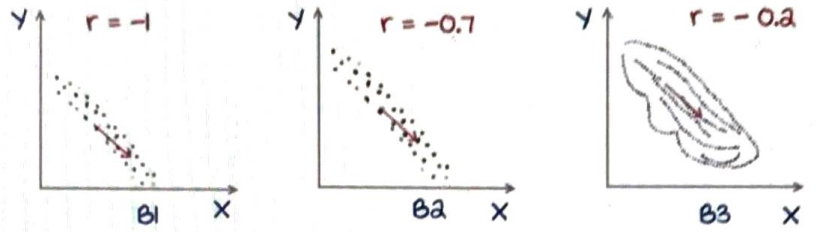
Scatter plots

Active space

Coefficient of determination 00:10:04



60c6b3eeaa8ded0e4e7e5ea7



+1 : Perfect positive correlation (1 unit change in X axis = 1 unit change in Y axis).

> 0.7 : Strong positive correlation.

0.5 – 0.7 : Moderately positive correlation.

< 0.5 : Weak correlation.

< 0.3 : Very weak correlation.

Coefficient of determination (CD) :

The percentage change in one variable which is accounted for by a unit change in another variable.

CD = r^2 in %.

Regression 00:18:26

Primarily refers to prediction.

Types :

1. Linear : If variables as quantitiative.
2. Logistic : If variables are qualitative.
    1. Univariate linear regression :
        Eg : Predicting renal failure based on GFR.
    2. Univariate logistic regression :
        Eg : Predicting MI based on obesity levels.
    3. Multivariate linear regression :
        Eg : Predicting the renal status based on serum Na, urea, creatinine and GFR levels.

Active space

4. Multivariate logistic regression :

Eg : Predicting the presence or absence of MI based on smoking and obesity levels, family history.

Linear regression, $y = a + bx$.

y : Dependent variable.

a : Regression constant.

b : Coefficient of independent variable/slope of curve

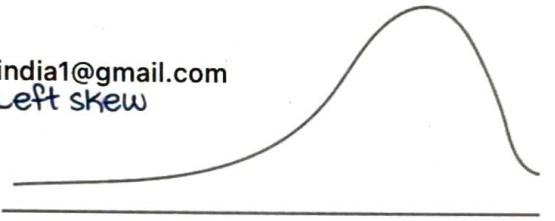
x : Independent variable

Skew

00:24:36

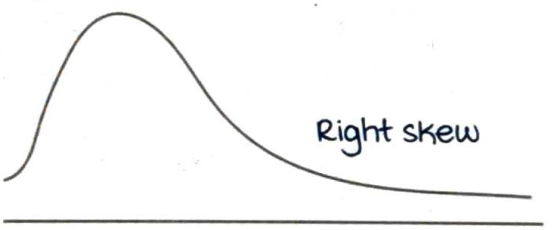
Describes a non normal distribution.

- Left skew (Direction based on the tail end) :

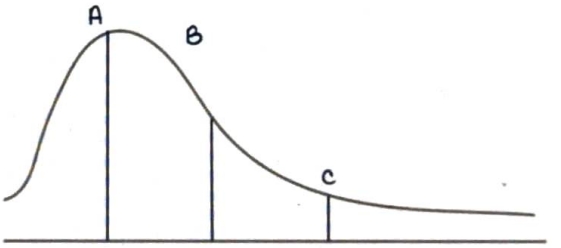


mean < median < mode (looking towards the left).

- Right skew :



mean > median > mode (looking towards the right).



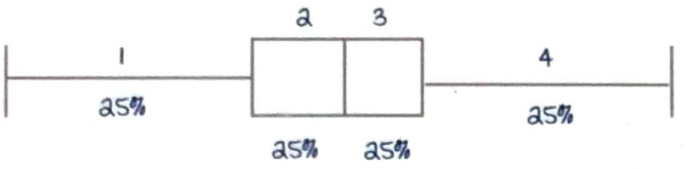
A : mode

B : median

C : mean

Since it's a right skew, mean > median > mode.

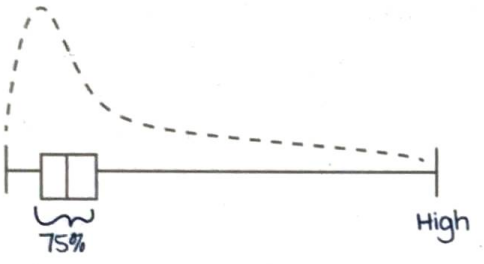
Skew and Box and Whisker (quartile) :



Each whisker : 25%

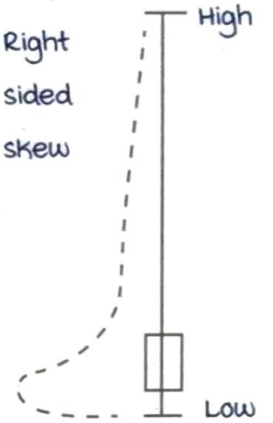
The box : 50%, each part : 25%

1.



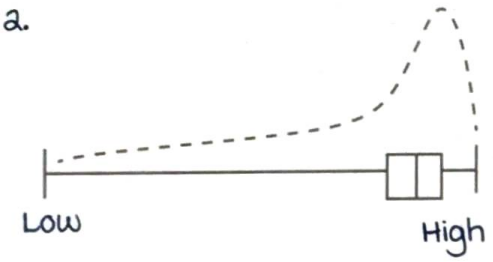
(Low)

Right side skew

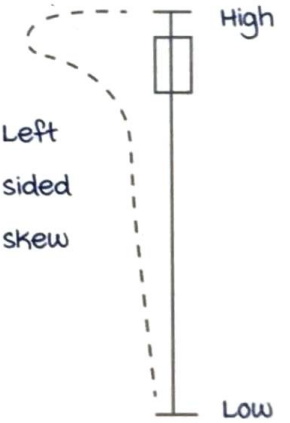


Conventionally if nothing is mentioned, left side is taken as the low side of the variable.

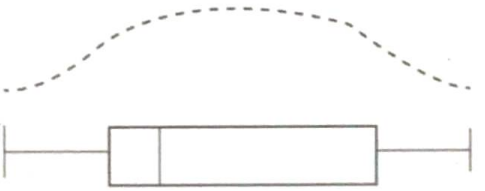
2.



Left sided skew



3.



Cannot comment about the skewness (deviated median).

Active space

SAMPLING METHODS AND CALCULATION

Sample :

- Quantity (calculation).
- Quality (sampling methods).

Both should be sufficient to represent the population.

Sampling methods 00:01:12

Types :

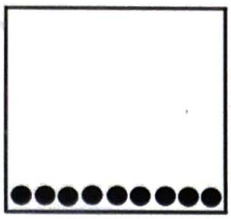
1. Non-probability/Non-random sampling :
    a. Convenience sampling :
        - Easy to perform.
        - Chance for selection bias.
        - may not be representative of total population.
    b. Quota sampling :
        - Predefined set of rules for sampling.
        - Chance for bias.
    c. Purposive sampling :
        - There is a secondary intention.
    d. Snowball sampling :
        - Rapidly increasing.
        - For example : 3 people bring 3 people each and in turn the new 3 people bring another 3 each.
        - Preferred in case of diseases with social stigma (hidden diseases) : Alcoholism

IV drug abuse
male to male
Transgenders

Active space

A classroom of 100 students to pick 9 students.

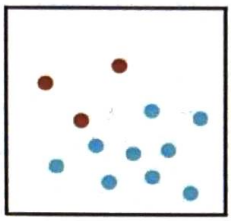
Convenience



9/100

Quota sampling

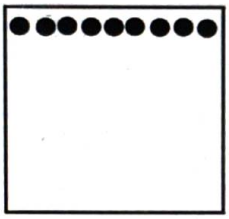
Students sitting in blue chairs are picked.



Rest red chairs

9 blue chairs

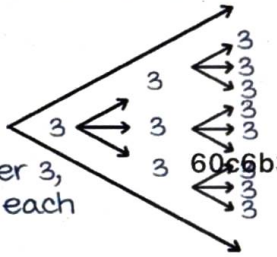
Purposive



9 backbench seated Students picked

Snowball

3 people brings another 3, who brings another 3 each and so on.



2. Probability/ Random sampling :

Every person should get a known/ equal chance.

Types :

a. Simple random sampling :

- Random number table method, Lottery method etc.
- Example : 100 patients in opd every day 9 patients have to be chosen.Selection could be using token method & random.
- Large trials possible
- most commonly used.
- A good method.

b. Systematic sampling :

- Every n^{th} individual is picked up.

c. Simple stratified sampling :

- The population is divided based on a certain criteria.

Active space

Population proportionate to size sampling (PPS)/Special stratified sampling :

- Population sample taken is proportionate to the size.
- Example : 90 people have to be chosen from 1000 people population to study diabetes mellitus.

Diabetes is disease of socioeconomic status.

90/1000 people

30 people from upper class.
30 people from middle class.
30 people from lower class.

But upper class was 10% of the population, middle class was 70% and lower class was 20%.

Hence discrepancies occurred.

To avoid discrepancy Population Proportionate To Size (PPS) done.

Each strata divdied & percentage of representation in whole population will be in the sample

9 people from upper class.
63 people from middle class.
18 people from lower class.

d. Cluster sampling :

- For homogenous, large population.
- Naturally occurring clusters are picked up randomly.
- To assess/ evaluate the health services.
- Eg : ICDS, UIP, NIDDCP.

In UIP → 30 clusters X 7 children.

(assess for immunisation status).

National Iron Deficiency Disorders Control Programme (NIDDCP) :

30 clusters X 90 children (equal no. of boys and girls)

Sample size calculation 00:16:52

$$\text{Sample size} = \frac{4PQ}{L \times L}$$

L : Absolute allowable error

P : Prevalence

Q : (100 - Prevalence) if in perecentage. or
(1 - Prevalence) if in decimal.

4 stands for error (error X error in 95%) ordenotes that the researcher have taken 95% confidence limit.

Clinical scenarios 00:17:59

Q. Calculate the sample size for a study to find the prevalence of hypertension with 95% confidence limit and an absolute error of 5%. The previous research shows a prevalence of 50% in the population.

A. 100
B. 400 → 4 x (50 X 50)/5X5
C. 900
D. 1600

Q. Calculate the sample size for a study to find the prevalence of hypertension with 95% confidence limits and a relative error of 10%. The previous research shows a prevalence of 50% in the population.

A. 100
B. 400
C. 900
D. 1600

Answer :

Absolute error →

Relative Error of prevalence : 10% of prevalence: 10% X 50% = 5.

sample size = (4X 50X 50)/ 5 X 5= 400.

60c6b3eeaa8ded0e4e7e5ea7

Active space

Q. An area shows the prevalence of hypertension as 50%. Calculate the sample size for a new study to find the prevalence of hypertension with 95% confidence limits and the researcher wishes to get the results within a range of 45- 55% prevalence

A. 100

B. 400

C. 900

D. 1600

median :range/2 = 10/2= 5.

Therefore L= 5.

Sample size : (4x 50 x50) / 5 x 5 = 400

Active space

PROBABILITY AND TILES

Probability and odds

00:00:29

Probability :

- The chance of an event to happen.
- It can be expressed as percentage or decimals.
- It ranges from 0 – 1 (maximum probability).
- Odds : Ratio of a probability to happen to the probability that the event will not happen.
- Probability = $\frac{\text{Odds}}{1 + \text{Odds}}$
- Pre-test probability : Prevalence.
- Post-test probability : Positive predictive value (PPV).

Odds :

- $\frac{\text{Probability of an event to happen.}}{\text{Probability that event will not happen.}}$

60c6b3eeaa8ded0e4e7e5ea7

- Odds = $\frac{\text{Probability}}{1 - \text{Probability}}$

Example 1 : On rolling a die once :

Chance of getting 6 → 1/6

Odds → 1/5.

Example 2 : While playing ludo with 2 chances/options, to get out of house on rolling 1 or 6.

Chance : 2/6

Odds : 2/4

Odds : $\frac{\text{Probability}}{1 - \text{Probability}}$

Example :

In a box of 100 balls, 50 balls are blue & 50 are red (all of same size & shape).

50 red balls.
50 blue balls.

With eyes closed :

Chance of picking up blue ball → 50% or 0.5.

Chance of picking 2 blue balls → Decreases.

Chance of picking 3 blue balls → Further decreases.

Active space

3 chances given out of which only one blue ball needs to be picked → Chance increases.

Rule of multiplication → Value of decimals decreases on multipllication.

Q. The prevalence of diabetes mellitus is 10% in a community. What is the chance that you meet 2 people and both are diabetic?

Answer : Probability of person A to be diabetic, $P_A = 0.1$

Probability of person B to be diabetic, $P_B = 0.1$

Probability of both the people to be diabetic = 0.1×0.1

(Rule of multiplication)

Out of 2/more options on using 'either/any/or' the chance increases.

To increase chances, rule of addition used.

Q. The prevalence of diabetes mellitus is 10% in a community. What is the chance that you meet 2 people and any of them are diabetic ?

Anwer : Probability of person A to be diabetic, $P_A = 0.1$

Probability of person B to be diabetic, $P_A = 0.1$

Probability of either A or B to be diabetic = 0.1 + 0.1

(Rule of addition)

Q. Prevalence of vitamin D deficiency in a population was found to be 70%, while the COVID test using RT-PCR was found to be in 10% of the population. What is the chance of a person to :

a. Have both COVID and vitamin D deficiency :

Vit D = 70%, 0.7

COVID = 10%, 0.1

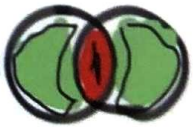
By Rule of multiplication = 0.07.

b. Have either COVID or vitamin D deficiency :

By Rule of addition = 0.8

c. Have either COVID or vitamin D deficiency but not both :

$0.8 - 0.07 = 0.73$

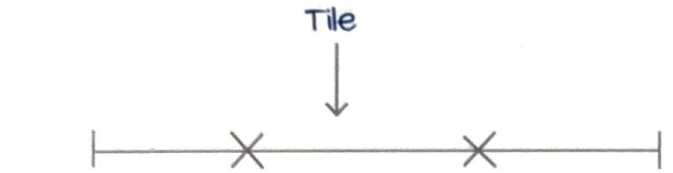
$0.7 \times 0.1 = 0.07$ covid =0.8  vitamin D =0.8

Active space

Tiles

00:14:40

Data is present in ascending order or descending order.



Ascending Descending

1 # 2

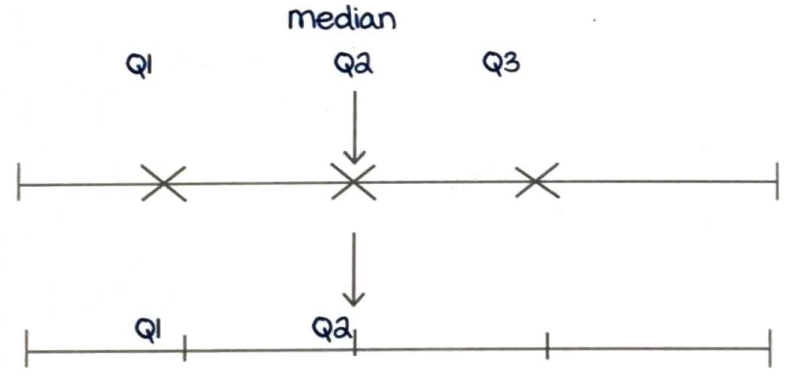
2 intercepts divide the data into 3 boxes / tiles (Tertile).

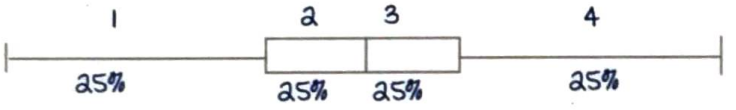
Intercepts	Tiles	Name	median
2	3	Tertile	T_1/T_2
3	4	Quartile	Q_2
4	5	Pentile	P_2/P_3
5	6	Hexile	H_3
6	7	Heptile	H_3/H_4
9	10	Decile	D_5
99	100	Centile	C_{50}

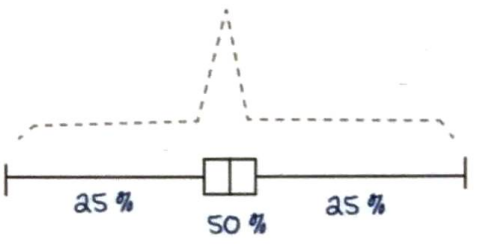
Centile : 100 tiles & 99 intercept : median : C50

Quartile :

Each tile of a quartile has 25% of the population.







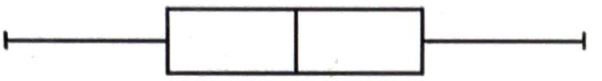
Active space

Box and Whisker chart

It describes :

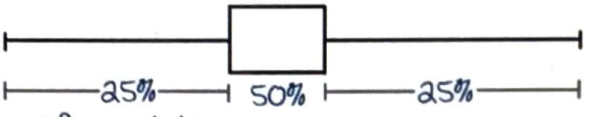
- Distribution of data.
- Skewness of data.
- Variation in data.

Example :



60c6b3eeaa8ded0e4e7e5ea7

For extreme values



Of population

Skewed

25% 50% (25% + 25%)

75% of population within lower side

Active space

GRAPHS

Data representation

00:00:38

Quantitative data :

- Histogram.
- Frequency polygon.
- Frequency curve, Ogive.
- Line chart (time).
- Scatter plots.

Qualitative data :

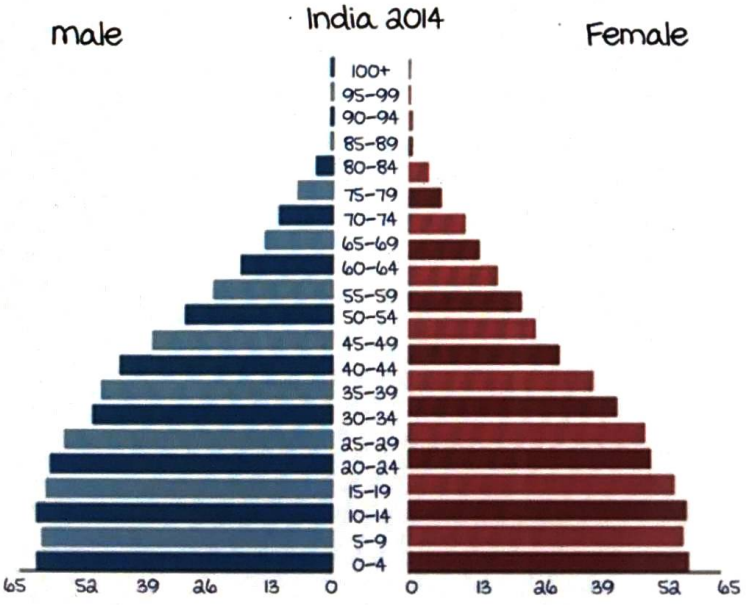
- Bar charts.
- Pie charts.
- Spot maps.
- Pictograms.
- Venn diagrams.

Histogram vs Bar chart vs Frequency polygon.

60c6b3eeaa8ded0e4e7e5ea7

Column charts can be either histogram or bar chart.

x-axis represents variable & y-axis represents frequency.



Histograms : Continuous, usually joined column charts.

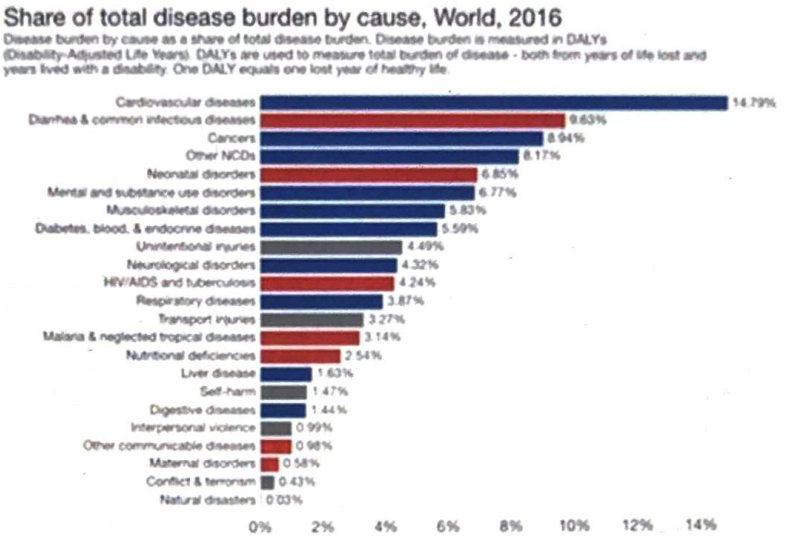
- Used for quantitative data.

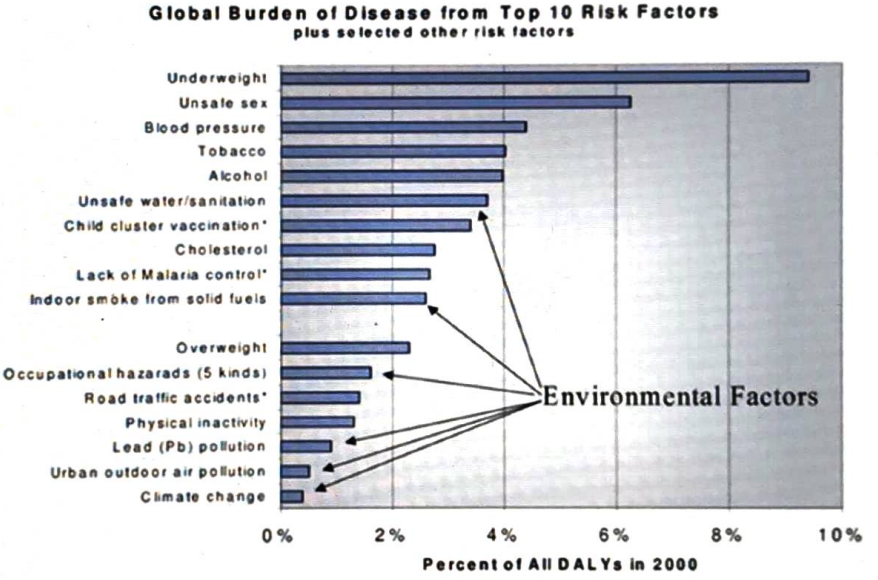
  The x-axis would define a quantitative variable.

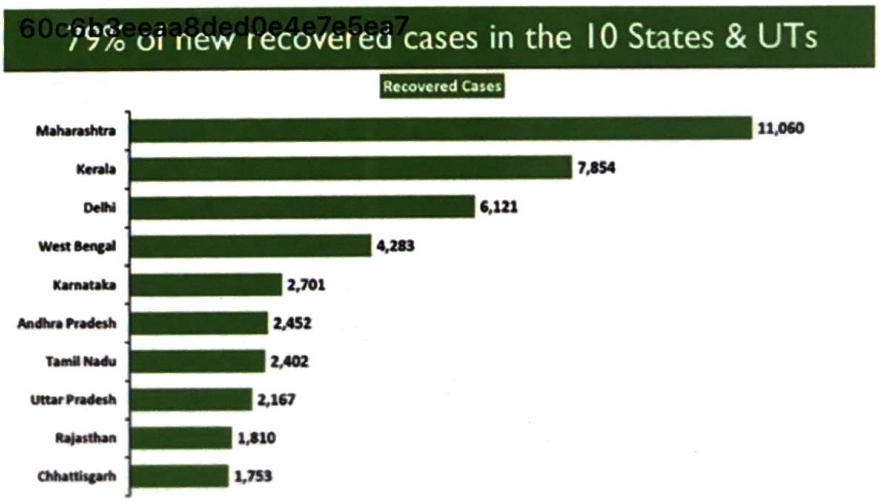
Active space

Bar charts : Discrete column charts that are usually distantly placed.

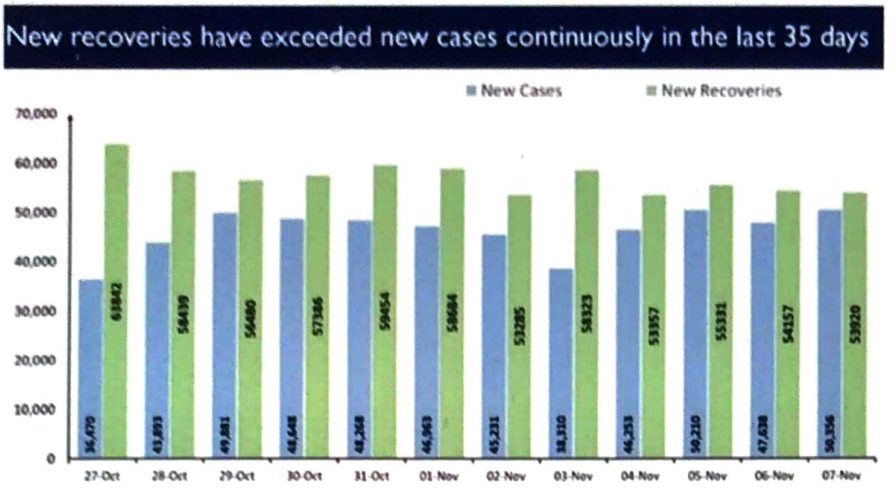
- used for qualitative data.
  The x-axis would define a qualitative variable.
  E.g. : Gender.



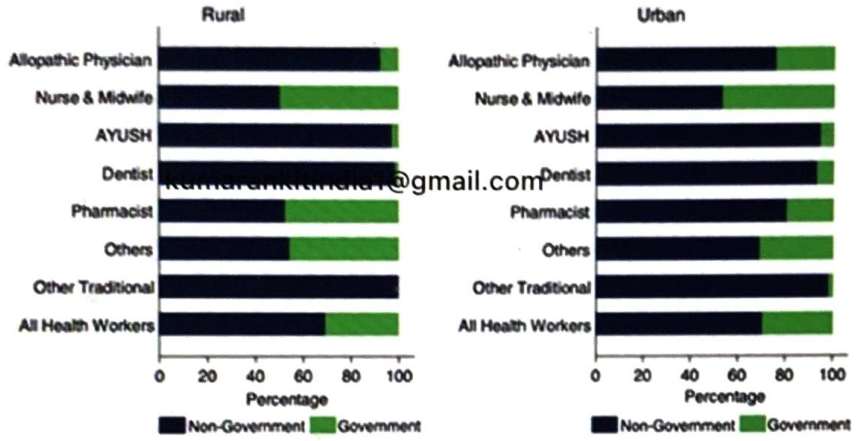




Active space



Multiple stacked bar chart.



Component Bar chart.

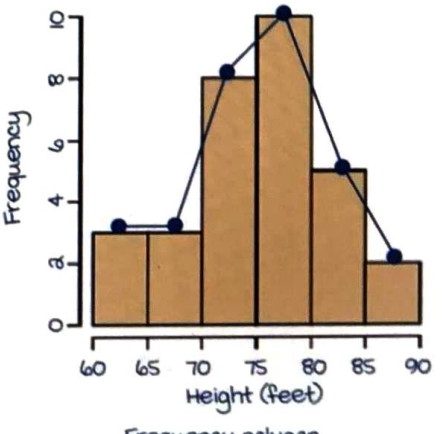
Frequency polygons : Formed by joining the midpoints of a histogram.

- used for quantitative data.

Frequency curve and frequency polygon 00:10:58

Frequency polygon :
Acute angles.
Smaller sample size or large class interval.

Frequency curve :
Smoother curve.
Small class interval or large sample.



Frequency polygon.

Active space

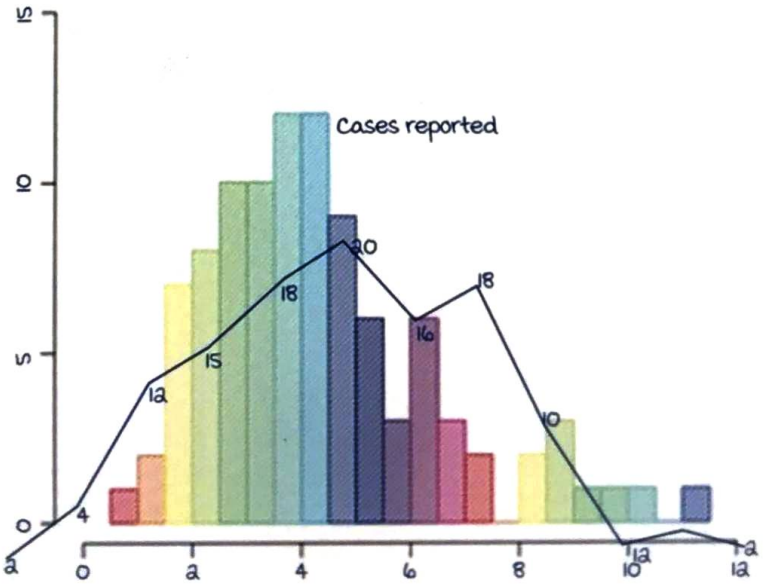
Consider the given problem.

Number of diarrhoea cases reported after an outbreak of food poisoning at a local cafeteria is charted, based on the number of hours or days of diagnosis.

It is then plotted as a histogram and frequency polygon.

Hours, days	Number of cases reported
6–12 hrs.	2
12–18 hrs.	4
18–24 hrs.	12
1–2 days	15
3	18
4	20
5	16
6	18
7	10
8	2
9	3
10	2

But this cannot tell the total number of cases at a point of time, or total number of cases on a particular day.



Ogive

00:18:24

For resolving the problem of not having the data for one particular day or at a point of time cumulative frequency is used.

Cumulative frequency is obtained by successively adding the frequencies above.

The cumulative frequencies are plotted on the graph, which gives an Ogive.

Ogive is plotted with cumulative frequency and variables.

Hours, days	Number of cases reported	Cumulative Frequency
6–12 hrs.	2	2
12–18 hrs.	4	6
18–24 hrs.	12	18
1–2 hrs.	15	33
3	18	51
4	20	71
5	16	87
6	18	105
7	10	115
8	2	117
9	3	120
10	2	122

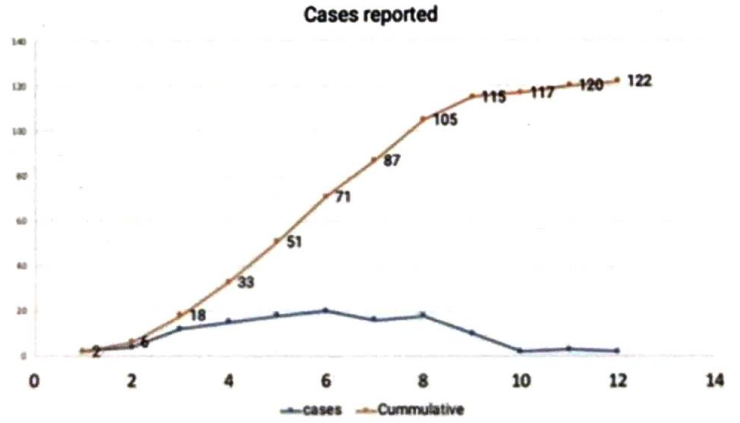
Ogive :

Formed by cumulative frequencies.

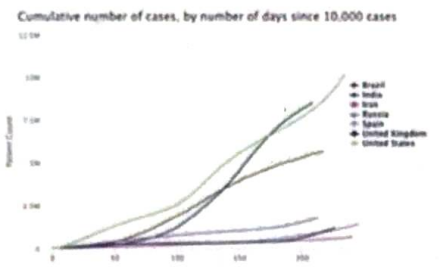
Formed in quantitative data.

Help in defining cut-offs.

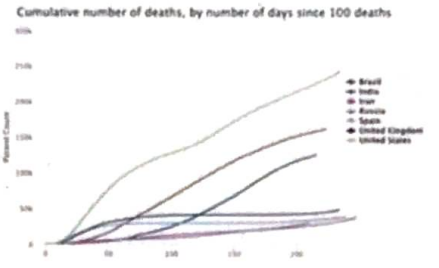
Curve is always uprising.



Cumulative number of cases (by number of days since 10,000 cases)



Cumulative number of deaths (by number of days since 100 deaths)



Scatter plots

00:23:28

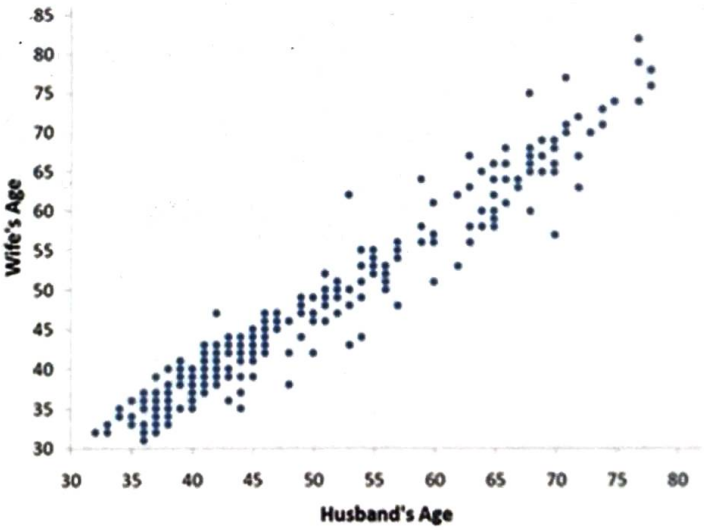
Both the axes are variables.

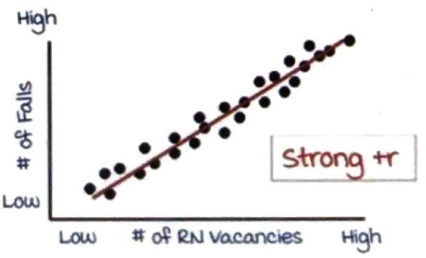
The scatter plot helps to define correlation between two quantitative variables.

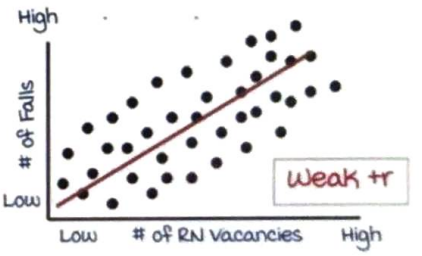
- Strong correlation : One variable increases, the other increases too.
- Negative correlation : One variable increases and the other decreases.
- Weak correlation : No relation to change in one variable.

Positivity of correlation is dependent on :

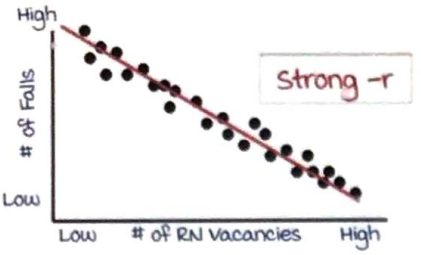
- Direction of vector.
- Distribution of scatter.

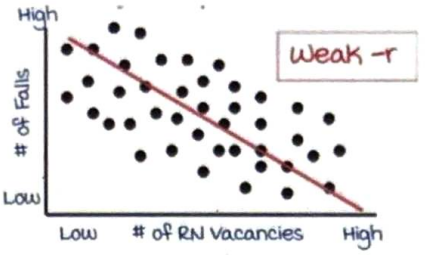






Active space



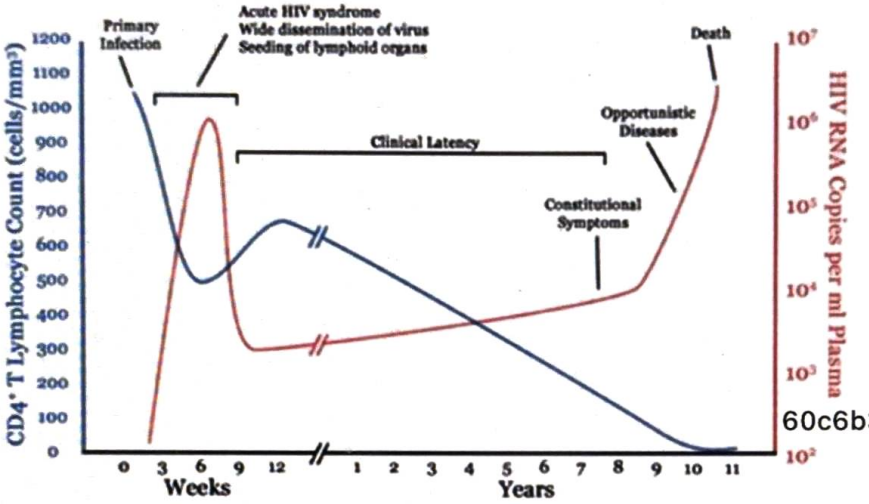


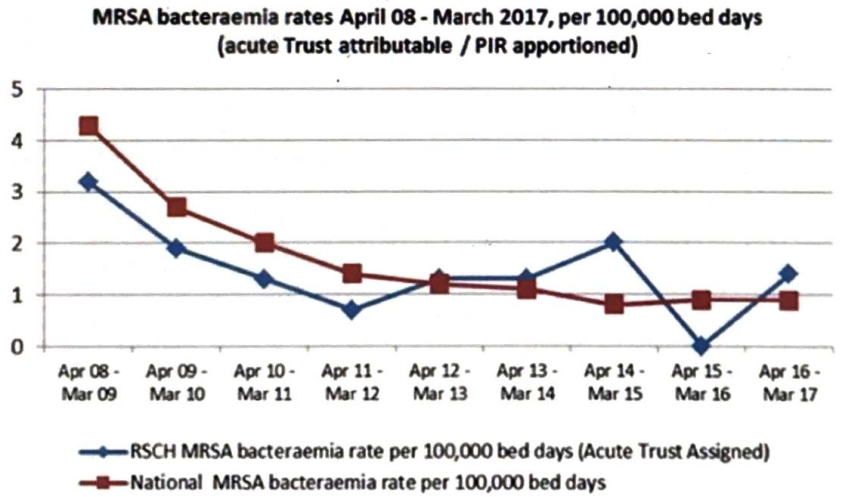
Line chart :

Time trend charts.

Used for quantitative data.

One of the axes is time.





Pie chart

00:32:10

Always in a circle.

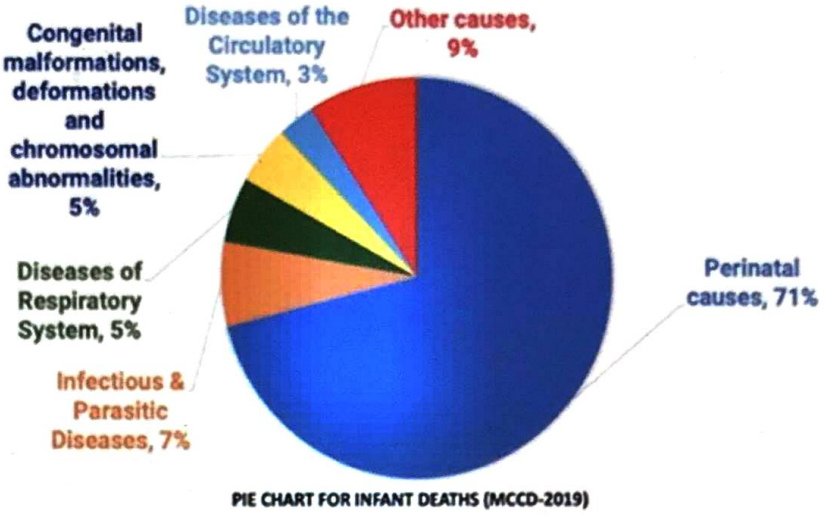
Always have a sectoral presentation.

Always use percentages, never the absolute numbers.

Qualitative data.

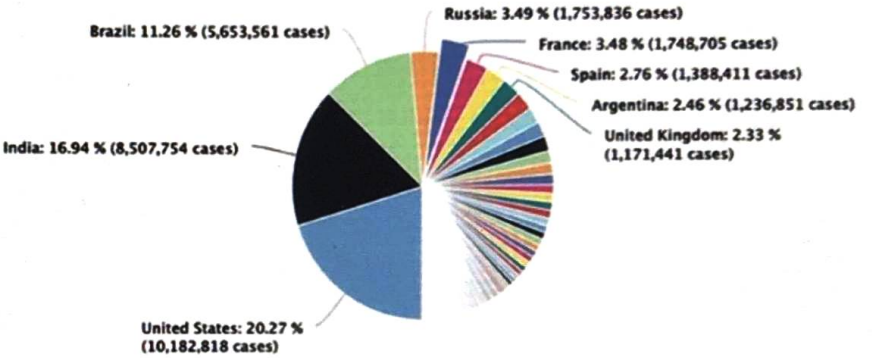
Best way to present technical data.

Active space



PIE CHART FOR INFANT DEATHS (MCCD-2019)

Distribution of cases

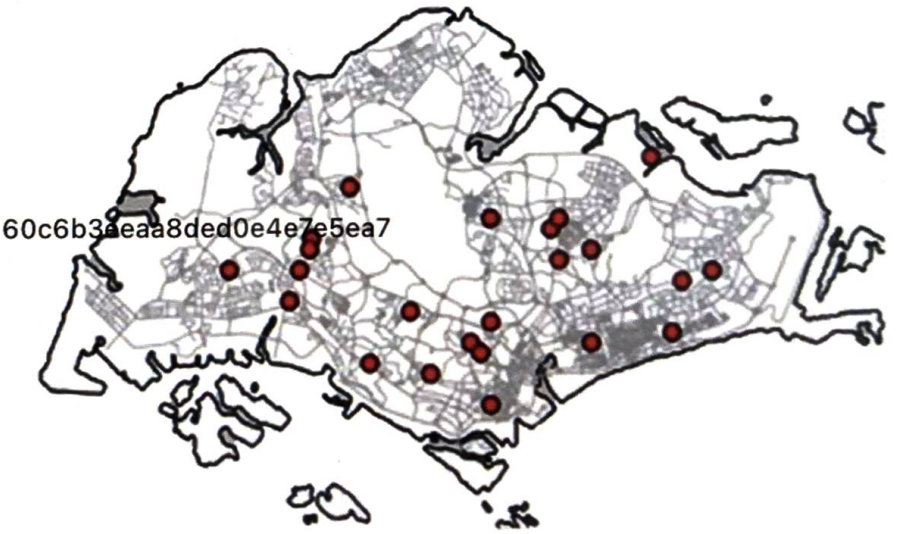


Spot map :

Qualitative data.

Tells the geographical location in a map.

Essential for micro planning.



Pictogram :

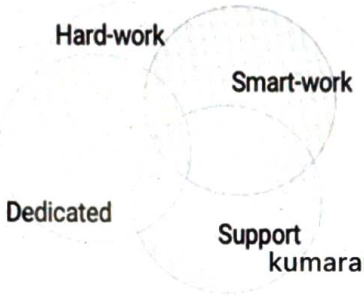
Uses symbols.

Used for general awareness for the public.

Best way to relay health awareness to the layman.

Active space

Venn diagram :
Used for qualitative data.
Used for overlapping qualities.



kumarankitindia1@gmail.com

Stem and leaf

00:40:14

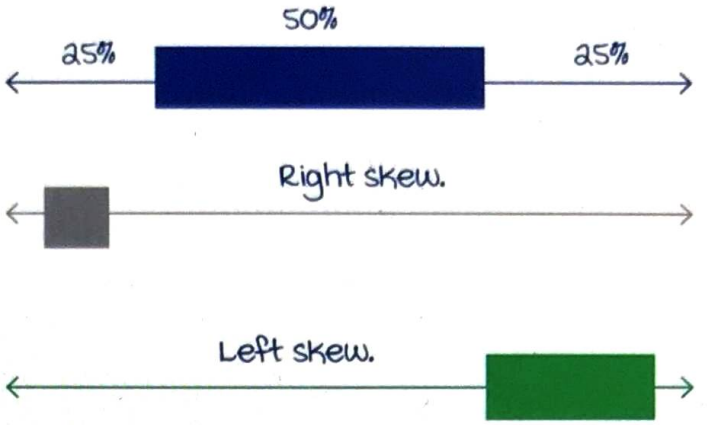
In the image, the bold numbers vertically down form the stem, and the branching numbers form the leaf.
The data is read to the right, along each horizontal line.
E.g. : The third line is read as 21, 23, 25, 26.

Stem	Leaf
0	2
1	1
2	1 3 5 6
3	3 3 5 6 8 9
4	6 9 9 8 9
5	3 5 6 6 7 8 9
6	1 5 7 8
7	3 5 6
8	1 2 2
9	3

Describes data distribution.
Can be used for quantitative and qualitative data.

Active space

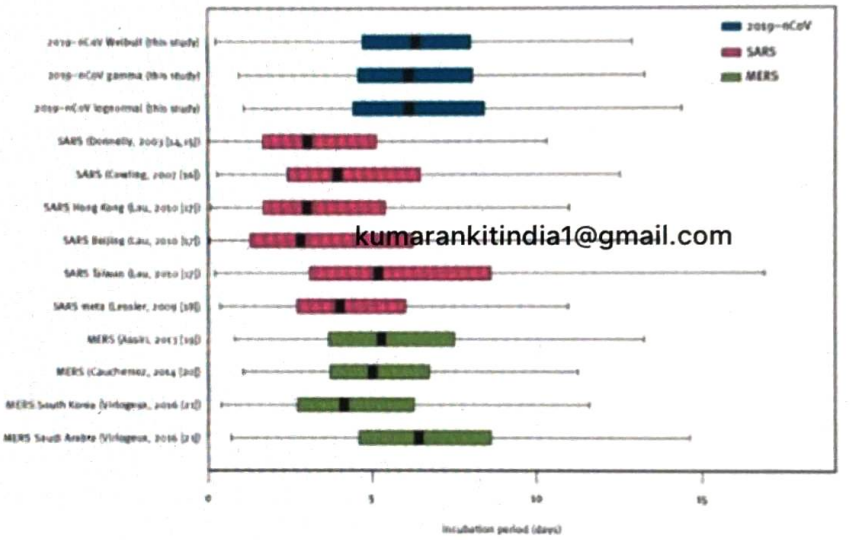
Box & whisker :



In a box and whisker, the entire box forms 50%, and the whiskers on each side make 25% each.

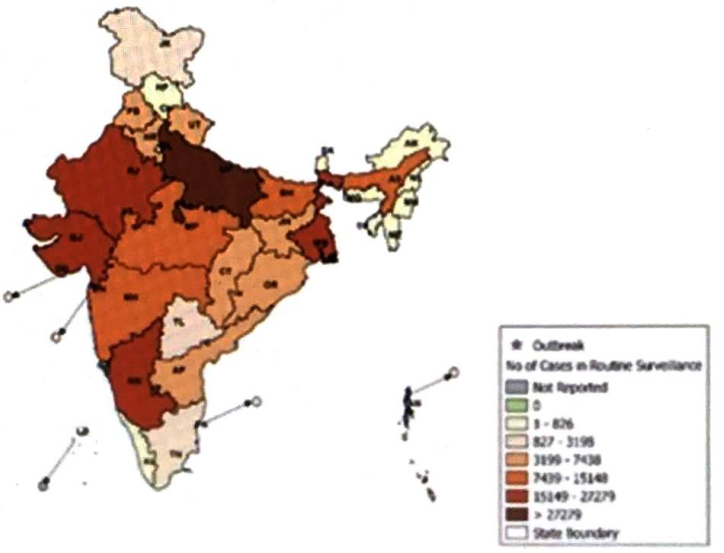
The box forms the inter quartile range : Q3 – Q1 (entire box).

Used for data distribution and data skew.

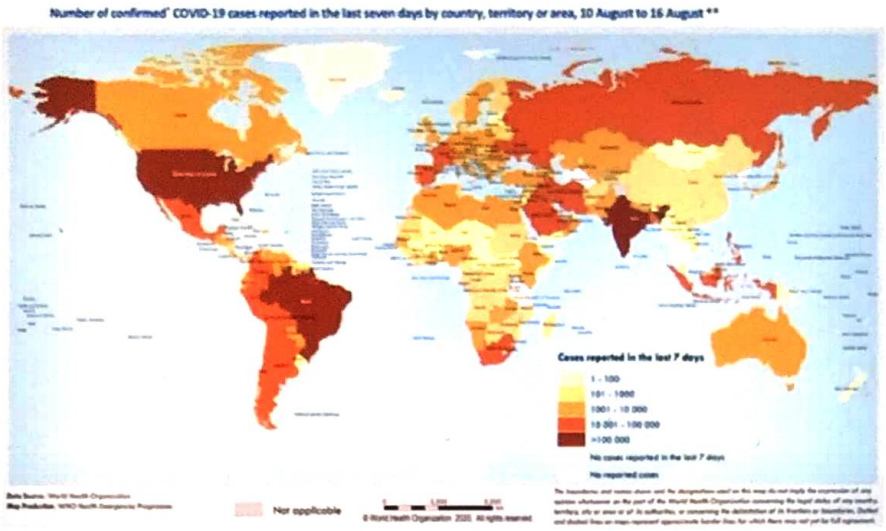


Choropleth graphs :

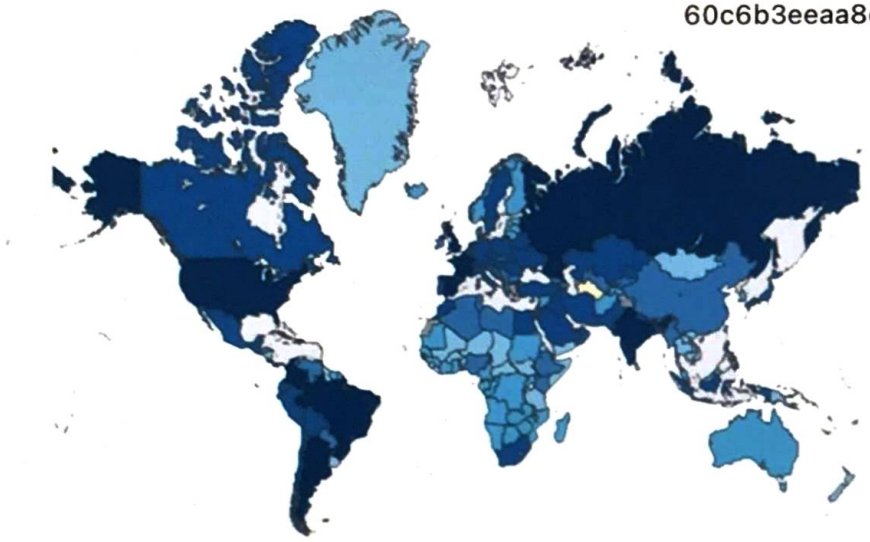
Describes the grades, intensity as per geographical boundaries by different shades of colour.



Active space

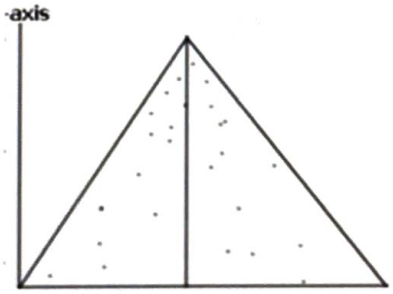


60c6b3eeaa8ded0e4e7e5ea7



Funnel plot :

Helps to define publication bias.



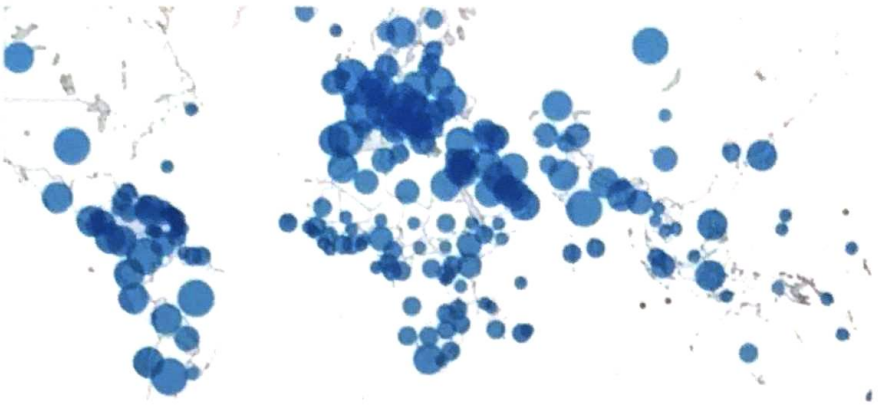
Bubble graph :

Intensity of the event, in a geographical boundaries, is described using bubbles.

The size of the bubble describes the intensity of the event.

Used to describe data like prevalence, incidence.

Active space

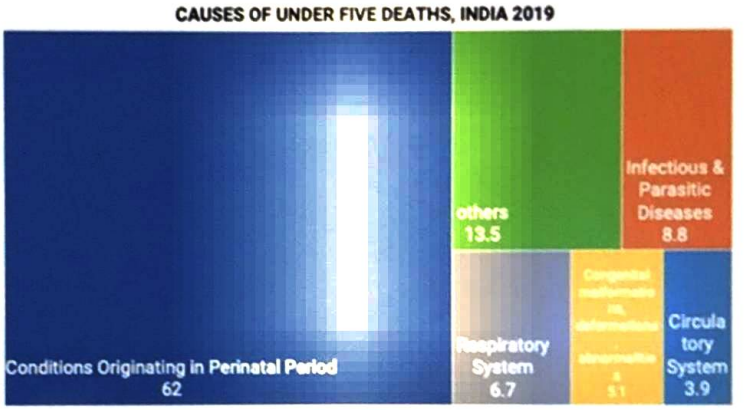


Tree map :

Advantage : Like the pie chart.

Sectoral presentation.

Absolute numbers can be used, not percentage alone.

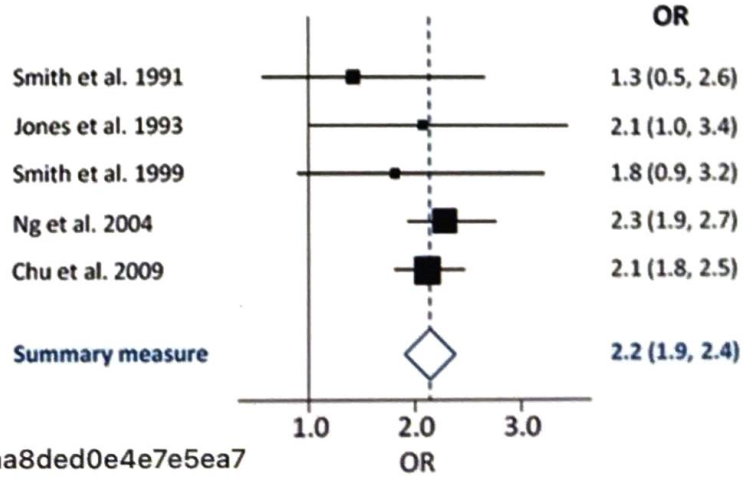


Forest plot :

Uses box and whiskers.

Median of all medians is shown by diamond.

Used in meta analysis i.e., evidence based medicine.



60c6b3eeaa8ded0e4e7e5ea7

Active space

BIOSTATS REVIEW AND Q&A ROUND

Biostats review

00:00:16

1. Data
   - Quantitative = mean → Interval, ratios.
   - Qualitative = Proportion → Nominal, ordinal.

2. Measures of CT : 3 median – 2 mean = mode.
3. Measures of variation :

   Standard Deviation(SD) = Root mean square deviation.
4. $[V] = SD^2$
5. CV = SD/ mean x 100.
6. Standard error for mean = $\frac{SD}{\sqrt{n}}$
7. Standard error for proportion = $\sqrt{PQ/n}$,

   P = Prevalence Q= 100 – prevalence n = Sample size.
8. Normal distribution curve :

   ± 1 SD → 68%

   ± 2 SD → 95% (corresponds to + or – 1.96SD/SE)

   ± 3 SD → 99%
9. Z score = $\frac{(\text{Observed} - \text{Expected})}{SD}$
10. ± 2 SE contributes to :
    - 95 % Confidence interval (CI)
    - p-value = 0.05
    - α-level = 5%
11. P value
    - > 0.05 : Non significant (Null Hypothesis rejected)
    - < 0.05 : Significant (Null Hypothesis rejected)
12. Null hypothesis can be :

    True : accepted

    rejected : Alpha/type I errors.

Active space

False : accepted

rejected : Beta/type 2 error.

13. 95% → 68% → Increased α level.
95% → 99% → Decreased α level/increased β errors.

14. Kappa test = $\frac{(\text{observed} - \text{expected agreement})}{(1 - \text{expected agreement})}$

15. Correlation coefficient : −1 to +1, where +1 is for perfect positive coefficient.

16. Coefficient Determination = r^2

17. Regression : $y = a + bx$, where b is slope of the curve.

18. Right skew : + skew (mean > median > mode).
Left skew : − skew (mean < median < mode).

19. CI + mean(prevalence) ± 2 × SE.

20. Sample size = $4PQ/(L \times L)$

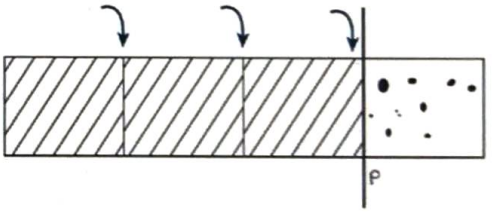
Q & A

00:06:42

1. A measure of location which divides the distribution in the ratio of 3 : 1 is

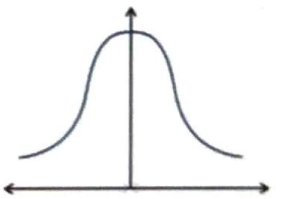
60c6b3eeaa8ded0e4e7e5ea7

A. Median.
B. First quartile.
C. Third quartile.
D. Mode.



2. Which of the statements are false about normal distribution curve?

A. Median is middle value.
B. 95% of values lie within ISD on either side. (It is 68%)
C. Mean, median & mode coincide.
D. Mean = 0.



Active space

3. A pictorial diagram of frequency distribution of quantitative data is denoted by which of the following :
   A. Pearson correlation vector diagram. → (For correlation)
   B. Histogram.
   C. Choropleth. → (For geographical data)
   D. Component bar chart. → (For qualitative data)
4. Central value of series is termed as :
   A. Mean.
   B. Mode. → (Frequently occuring value)
   C. Average.
   D. Median.
5. Median is almost equivalent to
   A. 100th percentile.
   B. 75th percentile.
   C. 50th percentile.
   D. 95th percentile.

6. In statistical analysis, dispersion of data is best measured.
   A. mode. (Frequent)
   B. Range.
   C. Standard error of mean.
   D. mean. (Average of tendency)

7. Root mean square deviation denotes
   H. Standard deviation.
   I. Standard error.
   J. Mean deviation.
   K. All of the above.

8. In standard normal curve, the area between one SD on both sides will be
   A. 68%
   B. 85%
   C. 99.7%
   D. none of the above.

9. Limit set up on either side of mean in a normal curve is called
   A. Normal limit.
   B. Probability limit.
   C. Standard limit.
   D. Confidence limit.

10. Z is a measure of
   A. Median.
   B. Mode.
   C. Regression coefficient.
   D. Standard normal deviate

$$Z = \frac{\text{Observed} - \text{Expected}}{SD}$$

Denotes location in terms of SD away from mean.

11. Standard error is due to
   A. Sampling error. ⟶ (Random error)
   B. Normal distribution of mean.
   C. Observer errors. ⟶ (Bias)
   D. Variability of the reading.

12. Chi-square test to a table of 4 rows & 4 columns, degree of freedom would be
   A. 1.
   B. 4.
   C. 9.
   D. 16.

   Formula = (row − 1)(column − 1)

   (4−1) (4−1) = 9

13. Which is true of cluster sampling
   A. Every 10th cases is chosen for study. ⟶ (Systemic)
   B. Stratification of population done. ⟶ (Stratified)
   C. A natural group as taken is sampling unit. ⟶ (Random)
   D. Involves use of random number. ⟶ (Simple random)

use : To evaluate health programs.

Active space

14. If sample size is increased 4 times, precision will:

A. Decrease 16 times.

B. Increase 16 times.

C. Increase 2 times.

D. Decrease 2 times.

Standard error for mean = $\frac{SD}{\sqrt{n}}$

Precision $\propto 1/SE$

So, $Pr = \sqrt{n}$, $n = Pr^2$.

Less error means high precision & viceversa.

Error is dispersion.

Precision : Repeatability

15. A researcher found out that students final year marks correlate with percentage of attendance in the classes, Karl pearson 'r' = 0.8, p = 0.001. This means that :

A. Student will improve his/ her grade by improving attendance.

B. 64% variation in final year marks is accounted for by class attendance.

CD = (r x r)% =64%

C. The correlation is too low to be of significance.⟶ r : is positive (not low)

D. The correlation is non-linear.⟶ Cannot say without graph

16. Test of association between two variables is done by:

A. Chi square test.

B. Correlation test.

C. Regression test.

D. Kaplan mier.

17. Rejecting a true null hypothesis is

A. High power.

B. Low specificity.

C. High beta error.

D. High α error.

Active space

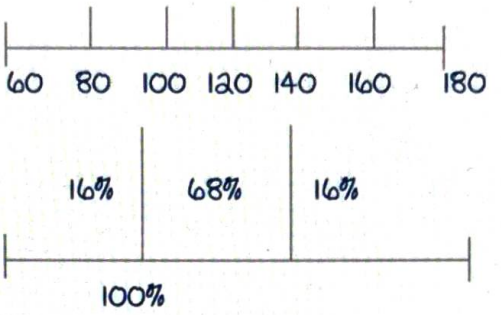
18. In normal distribution with mean 120 ± 20 mg/dL, how many individuals are expected to have FBS higher than 140mg/dL.

A. 0.5%

B. 2.5

C. 13.5%

D. 16%



19. In a study there were reported 36 deaths/ treatment failures out of sample of 120 with standard treatment. However, 26 treatment failures were reported from a sample size of 130 in the new drug experimental group. How many patients should be treated to avert 1 death?

A. 100.

B. 10.

C. 250.

D. 160.

Std =36/120 = 0.3

New drug = 26/130 = 0.2

$$\text{No. needed to treat} = \frac{1}{\text{Absolute risk reduction}}$$

$$\text{Absolute risk reduction} = \text{CER} - \text{EER}$$

$$= 1/0.1 = 10$$

CER : Control group event rate.

EER : Expected group event rate.

20. Consecutive readings of pulmonary capillary wedge pressure were obtained from a patient in the intensive care unit using Swan-Ganz catheter. The readings are 20mm Hg, 22mmHg, 21mmHg, 22mmHg, 18mmHg. Which of following is the median of the values given above?

Active space

A. 18mmHg.
B. 20 mmHg.
C. 21 mmHg.
D. 22 mmHg.

18 - 20 - 21 - 22 - 22

21. Two studies were conducted on different samples from the same population to assess the relationship between oral contraceptives use and risk of deep venous thrombosis. Study A showed an increased risk of DVT among OCP users, with a relative risk of 2.0 and a 95% confidence interval of 1.2-2.8. Study B showed relative risk of 0.8-3.1. Which of the following statements is most likely to be true regarding these 2 studies?

A. The p-value in study B is likely <0.05
B. The result in study A is not accurate.
C. The result in study A is not statistically significant.
D. The result in study B is likely biased.

will be getting positive odds ratio & association but 95% does not indicate.
on further analysis CI value contains 1 and hence

significant .It could be because of bias.
Odd ratio : ad/bc & it cannot be zero & negative.
odd ratio could be < 1 : negative & > 1 : positive association.
1 is not lying in the 95% zone so significant odds ratio & if inside : Non significant Odds ratio
Study A : Here, OR :2.01 & 95% : 1.2 -2.8 : significant
study B : Non-significant.

22. A standard study was conducted on 100 individuals with mean systolic BP of 120 +/- 10 mmHg. A new study is planned to be conducted in another 100 individuals from a similar population. What is the range within which the expected mean shall fall with 95% confidence limits.

A. 100-140mmHg.
B. 110-130mmHg.
C. 118-122 mmHg.
D. 119-121 mmHg.

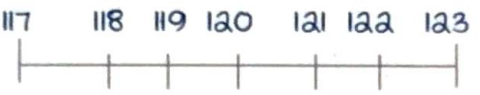
n=100 mSBP =120 ± 10
SE= SD /√n = 10/10=1

Active space

Therfore here SE=SD

Formula of CI = (mean orPrevalence) ± Z x SE .

= 120 ± 1.96 (~ 2) x SE =118 -122



23. A study was conducted on two different sample. The sample A had the mean value of 110 ± 11 while the sample B had mean value of 18 ± 3. Which of the following statement is correct.

A. Variation in sample A more than sample B.

B. Variation in sample B more than sample A.

C. Variation in sample B is approximately 4 times that in sample A.

D. It cannot be ascertained from information provided.

Formula of Coefficient Variation = (SD/ mean) X 100

For more variation, calculate coefficient of variation(CV)

sample A : mean= 110 ± 11

CV =11/110 =0.1

sample B : mean= 18 ± 3

CV=3/18 =1/6 = 0.16

Tests of significance

00:35:57

24. The test of significance for comparing haemoglobin levels in two villages will be :

A. Chi square test

B. Paired test

C. Unpaired t-test

D. Mc Nemar test

In group A & B Levels of Hb assessed.

For test of significance assess :

Type of data :

Quantitative/ qualitative, para meric/ non-parametric.

How many groups present : Single group or 2 or more

The test of significance for :

- Hb levels in 100 patients before and after IFA supplementation program : Paired t test.
- Proportion of obesity levels among CCU hospitalised patients before and after hospitalization : mc Nemar test.(Single group ,qualitative).
- TG levels among smokers and non smokers : Unpaired 't' test or Standard Error for mean.(2 groups, Quantitative).
- CRP levels among 3 groups of patients treated with remdesivir, HCQ and systemic steroid respectively : ANOVA test. (3 groups, Quantitative).
- Self reported comfort response among mil, moderate and severe COVID positive patients with spirometry exercise intervention : Wilcoxan rank sign test. (Qualitative,ordinal data).

Types :
Wilcoxan rank sum test :
Wilcoxan rank sign test : If each group paired then compare for before & after intervention.

- Response to nebulised LMW heparin in placebo and COVID cases by assessment of D-dimer assay : Unpaired t test (2 groups, quantitative).
- Assessment of DIC score (< 3 or > 3) as predictor of mortality in children with sepsis : Univariant logistic regression.

To compare : chi square test could be used.
But here to assess DIC as a predictor of mortality, hence univariant regression.
Based on quantitative/qualitative can be :

Univariant logistic regression : Qualitative.

Univariant linear regression : Quantitative.

For predictor mortalities : use cox regression models/ univariant regression analysis/multivariant regression analysis.

HEALTH CARE SYSTEM IN INDIA

Primary health care

00:01:10

Structure of health care system :

1. Primary level : Basic, available to everyone.
2. Secondary level : Specialized treatments.
3. Tertiary level : High end hospitals.

Approach to health care :

60c6b3eeaa8ded0e4e7e5ea7

1. Health Promotion.
2. Preventive health care services : Vaccines.
3. Curative services : ATT for TB, ART for HIV etc.
4. Disability limitation and Rehabilitative services.

ELEMENTS of primary health care :

- Education.
- Locally endemic disease prevention.
- Essential drugs.
- MCH and family planning.
- Expanded Immunization Program (UIP/mission Indradhanush/ intensified mission Indradhanush).
- Nutrition Supply.
- Treatment of common diseases.
- Safe water and sanitation.

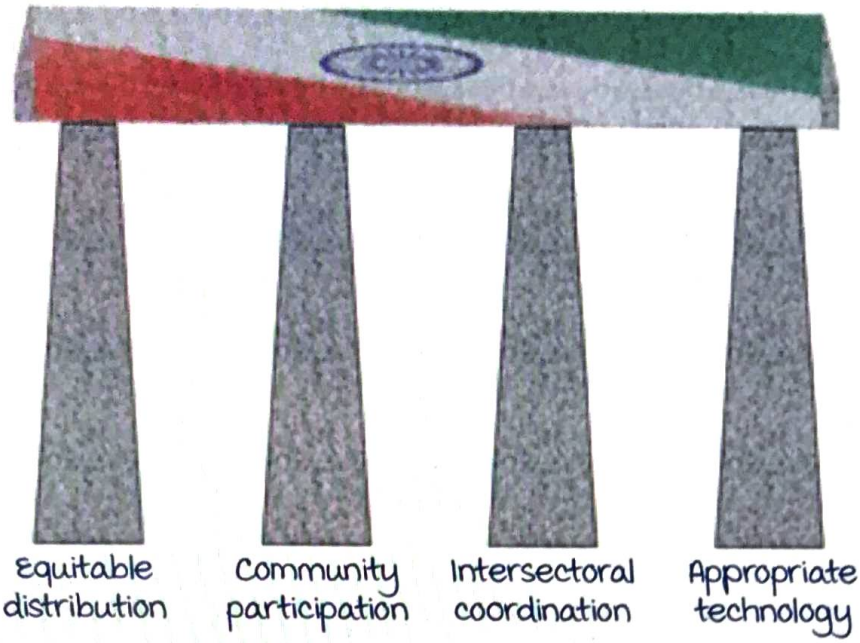
Principles of health care :

4 Pillars of our Nation :

1. Equitable distribution :
   - Healthcare given to those who needs it more.
   - As per the health need requirement.

2. Community participation :
   - Strongest pillar as it involves a community.
   - Example : Rogi Kalyan Samiti, ASHA, Mahila Aarogya Samiti.

Active space



3. Intersectoral coordination :

- Different departments work together for the healthcare system.
- Ministry of Education, Ministry of health and family welfare (Poshan abhyan, Poshan mission, Poshan shakti mission, Nirmaan mission) , Anemia Mukt Bharat, ICDS (Integrated Child Development services).

4. Appropriate technology :

- Nikusht app for leprosy.
- Nikshay app for TB.
- Adding Zinc to ORS.
- RCA latrines.

Health care system in India

00:10:40

India :

- 28 states, 8 Union territories
  ↓
  750 districts
  ↓
  Subdivisions
  ↓
  Tahsil/Taluk
  ↓
  Blocks.

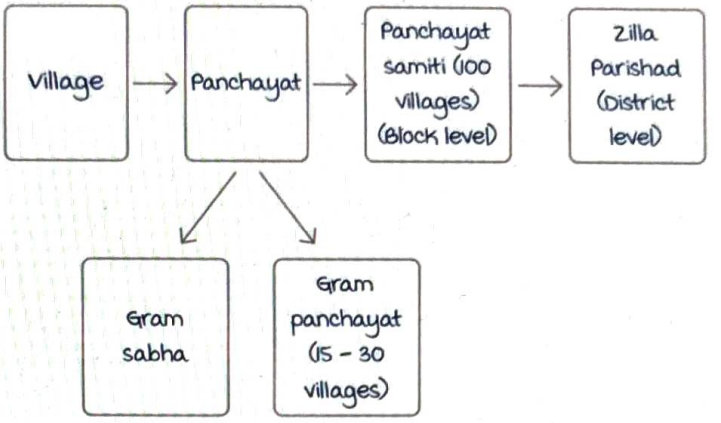
60c6b3eeaa8ded0e4e7e5ea7

- Blocks : Urban or Rural.
  1. Urban : Towns/municipal Boards/Corporation.
     a. Town : 5,000 – 10,000 population.
     b. Board : 10,000 – 2,00,000 population.
     c. Corporation : >2,00,000 population.

Active space

d. Metropolitan city : >1,00,00,000 (1 crore).

2. Rural : Panchayati Raj system.



1 village : 1000 population.

100 villages = 1,00,000 population : Block level

Rural health care system :

Rural sector structure : National Rural Health Mission (NRHM)

Division	Population	Workers	Beds
Village	1000	ASHA worker	No beds
Subcenter	HTF : 3,000 Plain : 5,000	MPW (1 male + 1 female).	0 – 3 beds
Public health center (PHC)	HTF : 20,000 Plain : 30,000	3 medical officer (MO) : 1. MO in charge. 2. MO AYUSH (Ayurveda Yoga Unani Siddha Homeopathy). 3. MO Dental. + ANM (Auxiliary nurse midwives) + Pharmacists + other workers + Health assistant.	4 – 6 beds

Community Health center (CHC)	HTF : 80,000 Plain : 1,20,000	Specialists : 1. Medicine 2. Surgery 3. OBG 4. Pediatrician 5. Anesthesiologist 6. Ophthalmologist + ANM (Auxiliary nurse midwives) + Pharmacists + other workers + Laboratory assistant + OT technician.	> 30 beds
District Hospital		Clinical specialties + specialized laboratories + staff nurses + ANM + pharmacists + program manager.	> 80 beds

HTF : Hilly, Tribal and forest (HTF) areas.

ASHA : Accredited Social Health Activist 00:24:23

- 25 – 45 year old female.
- Educational criteria : 10th pass.
- Married in the village and a permanent resident.
- At least 1 child, not more than 2 children.
- Needs to undergo induction training (Initially 7 days + 4 days for 4 sessions = 23 days).
- Functions :
  1. Home visits.
  2. Visit health facility.
  3. Important for VHSN (Village Health Sanitization and Nutrition) committee.
  4. Holds MAS(Mahila Arogya Samithi) meetings.
- Developed by NRHM in 2005.

MPW worker (Multi Purpose worker) :

- MPW male :
  1. Vector borne diseases :
     Insecticide sprays, malaria slides, fever treatment etc. taken care by MPW male.

2. Responsible for quality of water : Chlorination of wells, safe water supply.
3. Responsible for record keeping/register maintenance.
4. OPD/survey, maintenance of the sub center.

- MPW female :
  1. Antenatal care.
  2. Post natal care.
  3. Immunization.
  4. Growth and development.
  5. Family planning methods.
  6. Maintains registers for eligible couples/family planning.
  7. OPD/ survey.
- 1 year training.
- Developed by Kartar Singh committee in 1973.

Activities of an ASHA

Five key activities of an ASHA

Medical officers :

- OPDs.
- Team leader.
- Small surgeries.
- Medical/Drug system.

Health assistant :

- Management of the lower health staff (ASHA, MPW).
- Supervision.
- Assist in the health administration.

Active space

Program manager :

Manages programs at district level.

Urban health care sector :

Urban sector structure : National Urban Health Mission (NUHM)

Division	Population	Households
Urban ASHA (USHA)	1000 – 2500.	200 – 500 houses
ANM center	10,000	2000
Urban Public Health Center (U PHC)	50,000	10,000
Urban Community Health Center (U CHC)	2,50,000 in all the cities	50,000
District hospital	5,00,000 (metropolitan cities)	1,00,000

NRHM + NUHM : National health mission.

ICDS Scheme

Integrated Child Development Services :

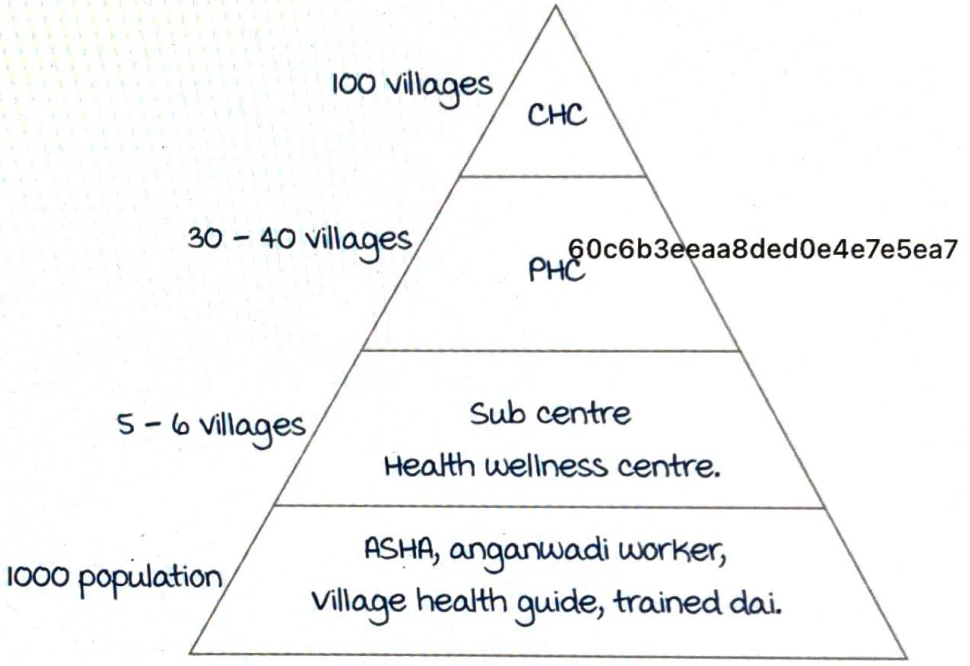
- Launched in year 1975.
- Under Ministry Of Women & Child Development (MOWCD).

Division	Population
Anganwadi	300 – 800
Anganwadi supervisor	25,000
CDPO (Child Development Project Officer)	1,00,000

Levels :

Rural	Urban	Others	Role in the system
Village	Urban ASHA	Anganwadi	Lowest system. Workforce. Pillars of India.
Subcentre	ANM centre		
PHC	UPHC	Anganwadi supervisor	
CHC	UCHC	CDPO	Block levels hospitals.
District hospital	District hospital		Administrative Unit.

	ICDS	Rural health	Urban health
District level		District hospital	District hospital
Block level	CDPO	Community health centre	U CHC
30 – 40 villages	Anganwadi supervisor	Primary health centre	U PHC
4 – 5 villages		Sub centre, HWC	ANM Centre, HWC
1 village (1000 population)	Anganwadi worker		USHA, Urban ASHA



Community participation :

Rogi Kalyan Samiti :

- Collection of seniors (educated) people will manage the health care facility in their area.
- Health infrastructure.
- Community involvement.
- Top levels : CHC / PHC.

Mahila Arogya Samiti :

- Collection of females from urban/rural groups.
- Help in growth and development of children.
- Lower levels : Village/subcenter levels.

Active space

IPHS

00:53:07

IPHS : Indian Public Health Standards

1. Government hospitals follow IPHS :
   - Quality maintenance.
   - Manpower in health facilities.
   - Financial rules.
2. Corporate hospitals accredited by NABH/NABL (National Accreditation Board for Hospitals/Labs).

3. Multispeciality hospitals accredited by JCI (Joint Commission International).

Subcenters :

- Type A subcenter : No or minimal facility for delivery services (0 – 1 beds).
- Type B subcenter : Equipped with facility for delivery services, averaging approximately 20 delivery/month (2 – 4 beds).

PHCs :

- Type A PHC : Less than 20 deliveries per month (4–6 beds).
- Type B PHC : Delivery load of 20 or more deliveries per month (6–8 beds).
- High load PHC : > 50 deliveries per month.

Public healthcare system : Population and area covered

		Subcenter	PHC	CHC
Level of care		Primary	Primary	Secondary
Population	Plains	5000	30,000	1,20,000
	Hilly and Tribal areas	3000	20,000	80,000
Staff		3 – 4 staff	13–14 (basic) (Desirable 18 – 21)	Basic : 45 – 46 Desirable : 50 – 52
Maintenance		Central government	State government	State government
Radial distance covered (in Kms)		2.6	6.6	15.6

Other mission

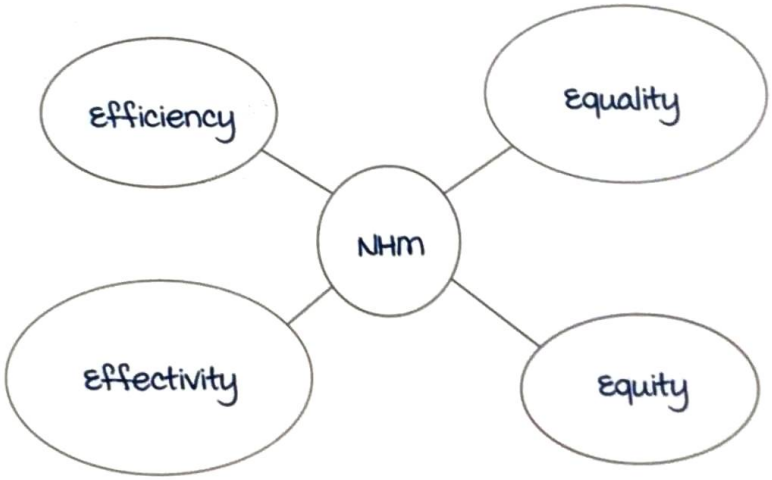
National Health Mission (NHM) :

NRHM : 12 April 2005.

NUHM : 1 may 2013.

5 Components of NHM :

Approach of NHM :



Equality : To the whole community.

Equity : As per requirement.

Efficiency : Good care.

Increased effectivity : Increased affordability & accepability leading to increased utilisation.

Ayushman Bharat scheme :

2 Sectors :

1. PM Jan Arogya Yojna.
2. Comprehensive primary health care : Opening of health and wellness centers.

   Health and wellness centers :

   - CHO (Community Health Officers : nursing officers).
   - Multipurpose workers + others.
   - Subcentres are upgraded to health & wellness centres.
   - 1.5 lakhs centres required by the government.

Suggested norms for health personnel 01:04:52

Suggested norms for healthcare personnel.

Category of personnel	Norms suggested
1. Nurses	1 per 5,000 population.
2. Health worker female and male	1 per 5,000 population in plan. area and 3,000 population in tribal and hilly areas.
3. Trained dai	One for each village.
4. Health assistant (male and female)	1 per 30,000 population in plain area and 20,000 population in tribal and hilly areas. Provides supportive supervision to 6 health workers (male/female).
5. Pharmacists	1 per 10,000 population.
6. Lab technicians	1 per 10,000 population.
7. ASHA	1 per 1,000 population.
8. Doctor	1 per 1000 population (WHO).

TB - EPIDEMIOLOGY AND DIAGNOSIS

TB epidemiology and diagnosis

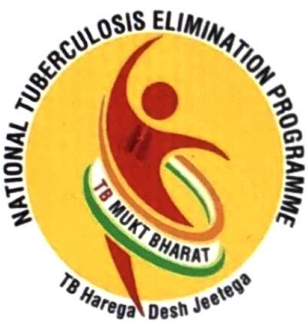
00:01:00

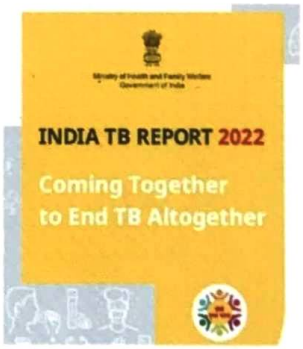
Untreated one case of TB can cause 10-15 new cases/year.

World TB day : 24th march.

Theme for National TB program in 2022 : Invest in TB, save lives.

Slogan of National TB elimination programme : TB harega desh jeetega.





New slogan for this year : TB Mukht Bharat.

Total TB notification (2021) : 19.5 Lakh.

Incidence of TB : 188 cases/lakh.

MDR notification	4 per Lakh
XDR notification	1 per Lakh
Case fatality rate	3-20%
Cause specific death rate	37 per Lakh

Active space

Epidemiological determinants :

Agent factors :

Mycobacterium tuberculosis

- Obligate aerobe.
- Facultative intracellular.
- Acid fast stain (Ziehl-Neelsen stain) due to mycolic acid in cell wall.

Other acid fast stain bacilli : Nocardia, Isospora, Mycobacterium leprae.

Robert Koch discovered mycobacterium tuberculosis on 24th March, 1882. (World TB Day)

Atypical mycobacteria :

- Photochromogens : M. Kansasii.
- Scotochromogens : M. scrofulaceum.
- Non photochromogens : M. fortuitum.

Host factors :

Peak age : 15-45 years.

Malnutrition/undernutrition is a major risk factor.

Social factors :

60c6b3eeaa8ded0e4e7e5ea7

Poverty, malnutrition, overcrowding, unhygienic conditions are risk factors.

Pathophysiology :

Primary TB :

Bacilli attacks the hilar area.

Ghons focus is the first lesion.

If there is involvement of lymph nodes along with Ghons focus, it is called as Ghons complex.

Ghons complex may calcify and form Ranke's complex.

Healed TB : In 95% of cases, TB infection is healed.

Progressive primary tuberculosis : TB bacilli may cause a local inflammatory reaction.
It is usually seen in children or people with low immunity.
may present with fever, chronic cough, pleuritis, pneumonia like illness, erythema nodosum, phlyctenular conjunctivitis.
Seen in < 1-2% of total primary TB cases.

Latent TB : TB bacilli is dormant. Seen in 2-4% of total primary TB cases.

Secondary TB/reactivation TB :
Under stressor, TB bacilli gets reactivated and causes cavitation.
Cavitation is a delayed type 4 hypersensitivity reaction.
Cavitation is common in the upper part of lungs as ventilation is highest and perfusion is lowest (V/Q ratio is maximum).
TB bacilli may spread from cavities through bronchus.
Person may spread tuberculosis.

Approximately 40% of the Indian population have had a primary TB infection.

Diagnostics in Tuberculosis 00:16:24

Chest X-ray :

- Cavitations can be seen.
- Non sensitive/non-specific investigation.

Sputum testing :

- Done in designated microscopy centers (DMC labs).
- 2 sputum samples : Spot sample (a) and morning sample (b) are collected.
- Checked within 24 hours of collection.
- Minimum 5 ml of sputum should be collected.
- Sputum should be expectorated. It could be mucoid, purulent or mucopurulent.
- Squamous epithelial cells should always be <10% in expectorated sputum.

Types of sputum testing :

Conventional microscopy (commonly used) : ZN staining is used.

LED microscopy : ZN staining is used. Better than conventional microscopy.

Fluorescence microscopy : Best test. Auramine-O Rhodamine stain is used.

Grading scales for bright fields (Ziehl-Neelsen) and fluorescence microscopy

Union/WHO scale 1000x field = hpf	Bright field (1000x magnification; 1 length = 2cm = 100hpf)	Fluorescene (200-250x magnification; 1 length = 30 fields = 3000 hpf)	Fluorescene (400x magnification; 1 length = 40 fields = 200hpf)
Negative	Zero AFB/ 1 length	Zero AFB/ 1 length	Zero AFB/ 1 length
Scanty	1-9 AFB/ 1 length or 100 hpf	1-29 AFB/ 1 length	1-19 AFB/ 1 length
1+	10-99 AFB/ 1 length or 100 hpf	30-299 AFB/ 1 length	20-199 AFB/ 1 length
2+	1-10 AFB/ 1 hpf on average	10-100 AFB/ 1 field	5-50 AFB/ 1 field/10
3+	> 10 AFB/ 1 hpf on average	> 100 AFB/ 1 field	> 50 AFB/ 1 field

100 hpf = 2 cm on the slide.

Sputum test has high sensitivity and good specificity.

Genotypic test (Rapid molecular test) 00:23:50

CBNAAT : Cartridge based nuclei acid amplification test.

- Has high specificity and good sensitivity.
- Diagnostic and confirmatory test.
- Tells whether mycobacterium is present or absent.

Biggest advantage of CBNAAT :

- Turnaround time is around 90 minutes (within 2 hours).
- Rifampicin status of a person (resistant or sensitive) can be known.

TruNAAT :

- Indianized version of CBNAAT produced from Goa.
- Less expensive.
- Approved by NTEP.
- Turnaround time is 1 hour.

Gene Xpert machine for CBNAAT

Line probe assay : Molecular test.

Advantages :

- Report available within 2-3 days.
- Resistance pattern can be found :

FL LPA (First line line probe assay) : Isoniazid resistance.

SL LPA (Second line line probe assay) : Resistance to fluoroquinolones , second line injectables/drugs.

Drug resistance	Target region
Isoniazid	inhA promoter, KatG.
Pyrazinamide	inhA promotor
Fluoroquinolone	gyrA, gyrB
Amikacin, Kanamycin, Capreomycin	rrs, eis promoter

H : Isoniazid, R : Rifampicin, Z: Pyrazinamide, E : Ethambutol.

Most common resistance is isoniazid resistance.

Phenotypic methods :

BACTEC method :

- C14 labelled palmitic acid immunoassay.
- Gives information about Co_2 emission by the live bacilli.
- Used for drug sensitivity testing and research.
- Used as second line investigation.

MGIT method :

- Gives information about O_2 consumption by the live bacilli.
- metabolism rate of the bacilli is known by this method.
- more specific.
- used for drug sensitivity testing and research.
- used as second line investigation.

Culture methods

00:34:10

Egg based (Solid media) : Lowenstein-Jensen media (LJ media). Takes about 8-10 weeks.

Agar based : Not used in NTEP.

Liquid culture : Using BACTEC/MGIT method.

Kirchner media or middle brook media are used. Takes about 1-2 weeks. Used in NTEP.

Serological test :

IGRA test (Immune gamma release assay) : Not used for diagnosis of TB in India.

IGRA test is used to diagnose latent TB in some countries.

Gives information about presence of TB bacilli.

Antigen/antibody test and Quantiferon test : Gives information about TB infection not disease.

Banned in India.

Tuberculin skin test

- Also known as Pirquet test/montoux test.
- 1 IU of PPD (purified protein derivative) RT_{23} with Tween-80 is used.
- Not used for TB diagnosis in adults.
- Has some utility in diagnosis of TB in children.
- Test is read after 48 hours, within 96 hours (wheal/flare reaction). Average time is 72 hours.

Consider positive if	In case of
more than 5mm	HIV, severe immunosuppression, close contacts of TB, history of prior TB
> 10 mm	Recent immigrants, IVDA, age less than 4 years, adoloscents with exposure from high risk groups. High risk occupation – HCW, care homes, prisons.
> 15 mm	No risk factor

2 step tuberculin skin test (TST) :
On repeated TST testing, sensitivity decreases and there will be no response to TST.
If TST is negative initially, repeat TST is done after 3 weeks.
On repeat testing, if test is positive, consider TST positive.

Diagnosis in NTEP :
Sputum for AFB and chest X-ray.
Xpert MTB/RIF : CBNAAT.
60c6b3eeaa8ded0e4e7e5ea7
Truelab real-time quantitative micro-PCR system (molbio diagnostics) : TruNAAT.
Line probe assay :

- FL LPA :
  rpoB gene for R resistance.
  In the KatG gene and the InhA promoter region for H (& ethionamide) resistance.
- SL LPA :
  Genes gyr A and gyr B for fluoroquinolone resistance.
  rrs and eis (low level Kanamycin resistance) for second line injectable drugs resistance.

Growth-based drug susceptibility testing (DST) (phenotypic tests : Research) :

- BACTEC MGIT 960 : An automated liquid culture system.
  Gold standard if other TB bacilli cannot be identified by other methods.
  Liquid culture is considered as gold standard.

Laboratory turn around time

Diagnostics	Investigation	TAT
Solid culture	Lowenstein-jensen medium	3 weeks - SP samples 4-8 weeks - SN samples
Automated liquid culture	BACTEC/MGIT 960 TB system	8-10 days - SP samples 2-6 weeks - SN samples
Molecular testing	Line-probe assay for detection of drug resistance	1-3 Days
	CBNAAT	2 hours
	TrUNAAT	1 hour for TB detection and 1 hour for resistance detection
Rapid TB identification	Immunochromatographic assay to be performed on solid or liquid culture growth	15 mins

SP : Sputum positive. SN : Sputum negative.

60c6b3eeaa8ded0e4e7e5ea7

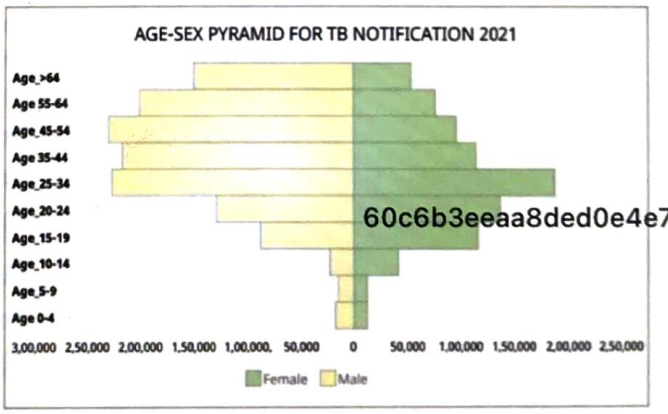
NTEP : DIAGNOSIS AND TREATMENT

National TB elimination program 00:00:14

1962 : National TB control program was started.
1997 : Revised National TB control program (RNTCP).
Directly observed treatment short course (DOTS) was started.
2020 : National TB elimination program.

As per Indian TB report 2020 :

- TB incidence : 188 per lakh.
- MDR cases : 4 per lakh
- XDR cases : 1 per lakh.
- Median age : 15-45 years.
- Incidence is more in males compared to females.
  MDR & XDR TB are on a slight decline.

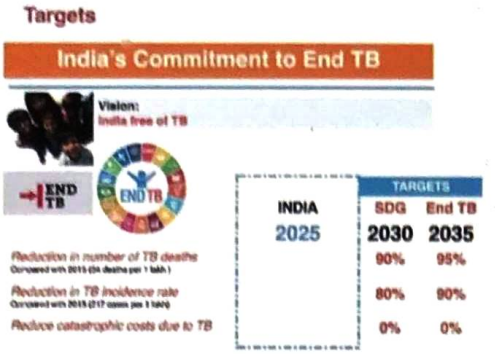


Median age group of acquiring TB infection is from 15-20 years to 40 years. More in males than females.

World TB day is observed on 24th march every year. The theme for the year 2022 is 'Invest to end TB, Save lives'.

Active space

Targets : End TB means to reduce TB deaths & incidence.



SDG (Sustainable developmental goals) was started in 2015 & will be in place till 2030.

60c6b3eeaa8ded0e4e7e5ea7

SDG targets to end TB by 2030 with reduction in death by 90% and incidence by 80%, while WHO targets to end TB by 2035 with reduction in death by 95% and incidence by 90%

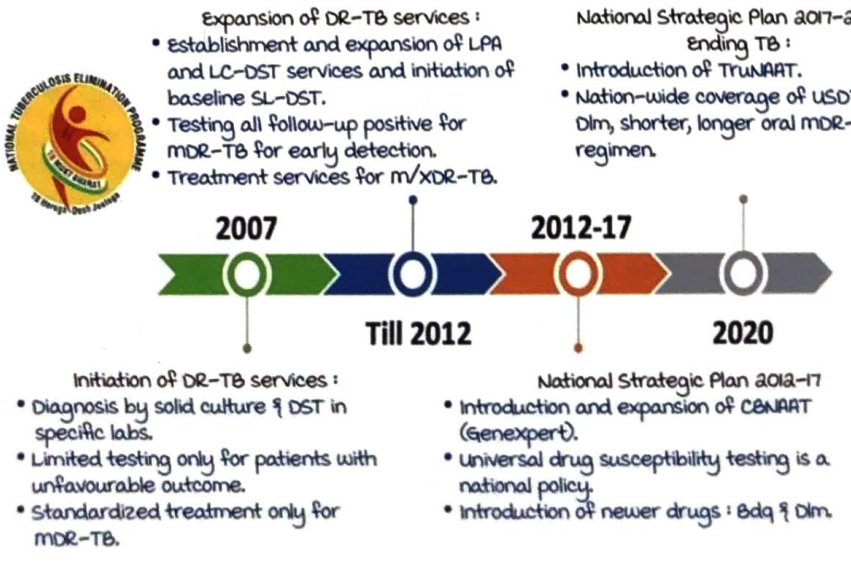
NTEP (India) targets to end TB in 2025 by reducing mortality < 90% & incidence < 80%

National strategic plan 2017-2025 for ending TB :

- Nation-wide coverage of universal drug susceptibility testing : Universalization of CBNAAT.
- Promoting 2 newer drugs : Bedaquiline (Bdq), Delamanid (Dlm).
- Introduction of TruNAAT (Indian version of CBNAAT).
- Shorter and longer oral MDR-TB regimen.

NSP for India, Targets

Milestones in evolution of PMDT in India



Active space

Definitions

00:10:03

Presumptive TB case :
Any person with complaints of cough or fever or night sweats for ≥ 2 weeks ± significant weight loss.

Drug sensitive tuberculosis :
Sensitive to Rifampicin and Isoniazid.

Drug resistant tuberculosis : Resistance to any drug.

H-mono drug resistant tuberculosis :
Only Isoniazid resistance.

Multi drug resistant tuberculosis (MDR TB) :
Resistance to at least Isoniazid and Rifampicin (H & R)
Poly drug resistant tuberculosis :
Any two drug resistance not including Isoniazid and Rifampicin simultaneously.

Extensively drug resistant tuberculosis (XDR TB) :
Resistance to H (Isoniazid) + R (Rifampicin) + Any fluoroquinolone + Any group A drug (Bedaquiline, Linezolid).

Pre XDR TB :
Resistance to H (Isoniazid) and R (Rifampicin) + any fluoroquinolone.

Grouping of anti-TB drugs and steps for designing longer MDR-TB regimen

Groups & steps	medicine	Abbreviation
Group A : Include all three medicines	Levofloxacin or moxifloxacin	Lfx mfx
	Bedaquiline	Bdq
	Linezolid	Lzd
Group B : Add one or both medicine	Clofazimine	Cfz
	Cycloserine or Terizidone	Cs Trd

Active space

Group C : Add to complete the regimen and when medicines from group A and B cannot be used	Ethambutol	E
	Delamanid	Dlm
	Pyrazinamide	Z
	Imipenem-cilastatin or Meropenem	Ipm-Cin Mpm
	Amikacin (or Streptomycin)	Am (S)
	Ethionamide or Prothionamide	Eto Pto
	p-aminosalicylic acid	PAS

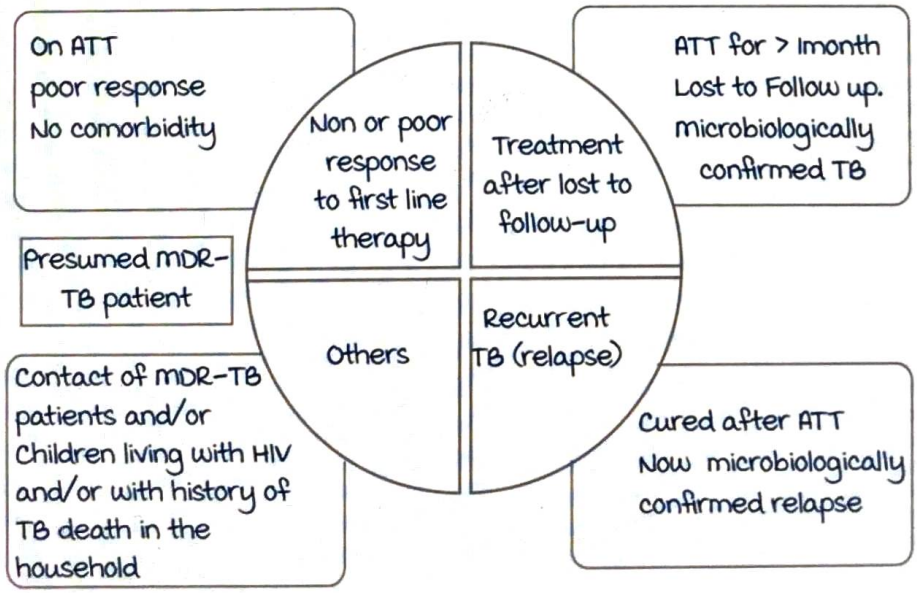
Presumptive MDR

00:17:24

- ATT for > 1 month and default for > 1 month (lost to follow up)
- Currently on ATT, poor response (no clinical improvement or sputum positive at 3rd or 5th month of follow up).
- Any contact of MDR case.
- Recurrent TB : Cured after ATT. But now microbiologically confirmed sputum positive.

60c6b3eeaa8ded0e4e7e5ea7

Note : Relapse of TB is no longer a used terminology & is replaced with recurrent TB.



Active space

Diagnosis

00:20:26

Presumptive TB case :
Sputum test + NAAT + Chest X-ray.

NAAT could be Cartridge based nucleic acid amplification test (CBNAAT) or TruNAAT.
Sputum test (Highly sensitive) is minimum requirement.
CBNAAT (Highly specific) is preferred if facility is available.

If sputum test and NAAT are negative, chest X-ray is normal

↓

Rule out TB and refer.

If sputum test is positive and NAAT is positive

↓

microbiologically confirmed TB case.

Presumptive TB

↓

microscopy, NAAT and CXR

↓

Rifampicin (S) TB

↓

At health facility
CHO/MO- HF/HCP

↓

Drug Sensitive TB regime :
- Send to treatment supporter.
- Screen contacts of TB.

Rifampicin (R) TB

↓

F/S line probe assay

↓

Depending on results :
- H-mono poly drug resistant TB.
- Rifampicin resistant TB.
- MDR TB.
- Pre XDR TB.
- Poly drug resistant TB.
- XDR TB.

F/S : First/second line

H/R resistant presumptive TB/ previously DSTB patient, Non responder, failure, follow up positive

↓

NAAT and first line-line probe assay

↓

RS HS | RR HS | RS HR | RR HR

RS HS → At health facility CHO/MO-HF/ HCP

↓

DSTB Regimen

- Send to treatment supporter
- Screen contacts of TB

DSTB – Drug sensitive TB
RS – Rifampicin sensitive
RR – Rifampicin resistant
HS – Isoniazid sensitive
HR – Isoniazed resistant

* Repeat NAAT if previously done microscopy for presumptive high risk

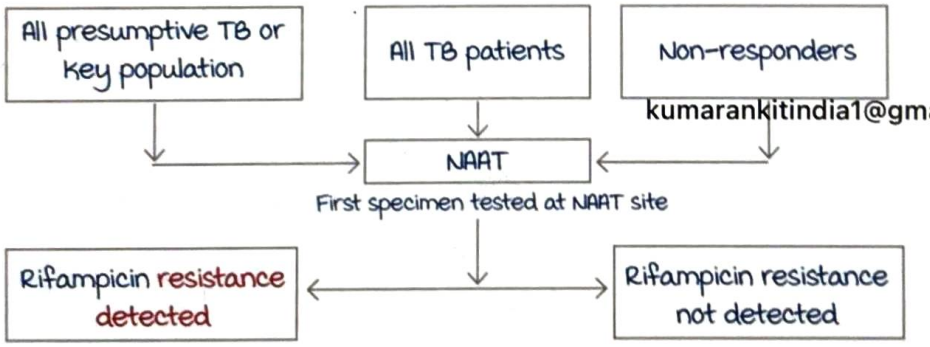
RR HS / RS HR / RR HR → F/S line probe assay lab

Depending on results :

- H – mono/poly drug resistant TB
- Rifampicin resistant TB
- MDR TB
- Pre XDR/XDR TB
- Poly drug resistant TB
- XDR TB

Integrated drug resistant (DR) TB diagnosis and treatment algorithm

00:32:34



If Rifampicin resistance not detected (Rifampicin sensitive) :

Do First line LPA (FL LPA)

↓

H resistance detected

(SL LPA) ↓ Testing

H mono drug resistance regimen

First line LPA (FL LPA)

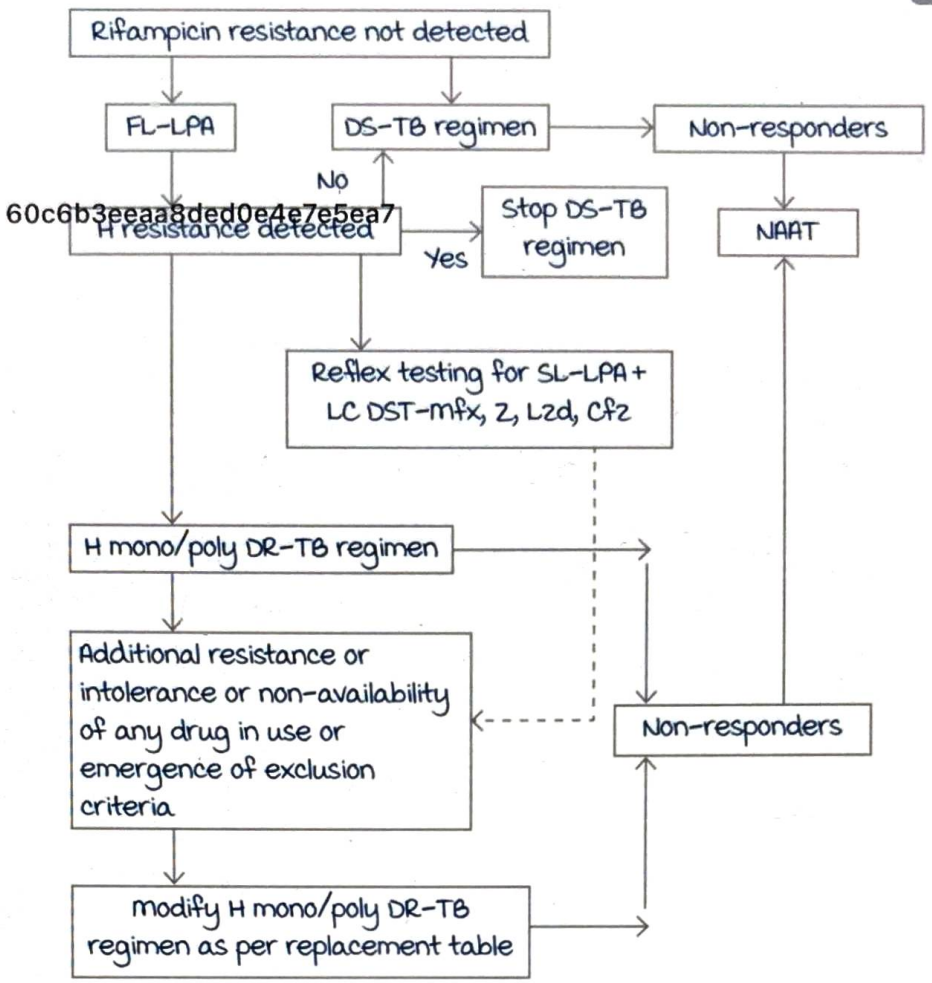
↓

No H resistance

↓

Drug sensitive (DS-TB) TB regimen.

LPA : Line probe assay



Rifampicin resistance detected

↓ FL LPA and SL LPA testing

1. H resistance along with
   - Single gene mutation (either KatG or InhA) or
   - No H resistance (H sensitive R resistant)

↓

Shorter oral Bedaquiline regimen.

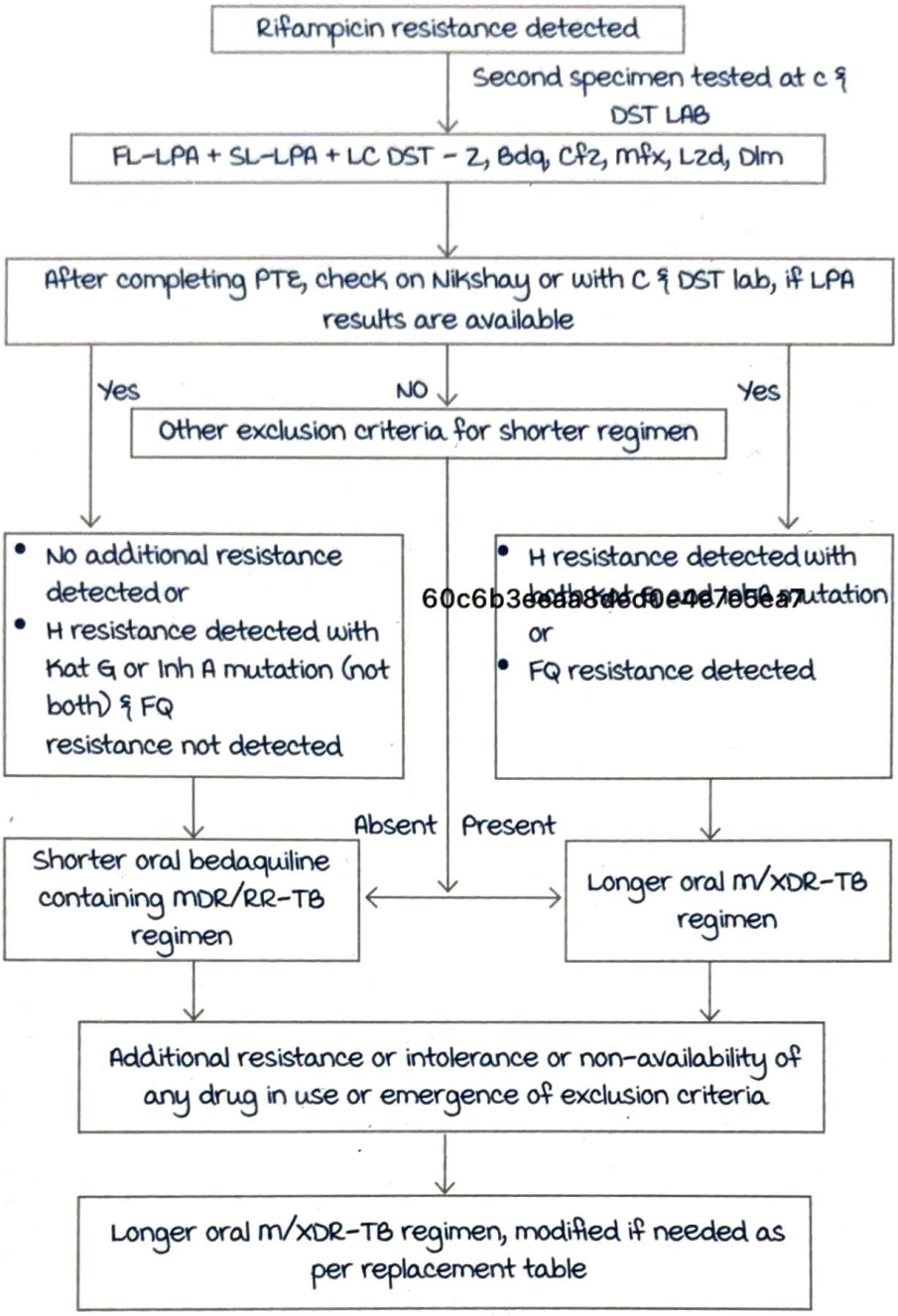
Shorter oral Bedaquiline regimen is given for :
- R resistant TB.
- MDR TB with R resistance and single gene mutation H resistance.

2. H resistance along with
   Both gene mutations (KatG and InhA) or
   Resistance to any fluoroquinolones

↓

All oral longer Bedaquiline containing regime (MDR/XDR-TB regimen) or optimized basal regimen (give drugs based on sesitivity testing).

Active space



Drug regimens

00:44:21

Regimen class	Intensive phase	Continuation phase
Drug sensitive TB	(2) HRZE : Fixed dose combination given daily.	(4) HRE
H mono/poly drug resistant TB	(6) ZERO	-

Shorter oral bedaquiline regime (shorter MDR)	(4–6) (CHOBZEE) Clofazimine, High dose isoniazid (H), Levofloxacin, Bedaquiline, Pyrazinamide, Ethambutol, Ethionamide. Bedaquiline is always given for 6 months.	(5) (COZE) Clofazimine, Levofloxacin, Pyrazinamide, Ethambutol.
Longer M/XDR- TB regime	(18–20) Levofloxacin, Linezolid, Clofazimine, Cycloserine, Bedaquiline (La Ca BDQ).	-

Pyridoxine is given to all DR-TB patients as per weight band.

H : Isoniazid, R : Rifampicin, Z : Pyrazinamide, E : Ethambutol, O : Levofloxacin.

Number inside bracket indicates months.

Patient started on TB treatment becomes 50–80% non infectious within 48 hours of taking Rifampicin and >95% non-infectious by 2 weeks.

Shorter oral bedaquiline regimen/shorter MDR (CHOBZEE regime) :

Start till 4 months	5th and 6th month	7th till 9th month
Bedaquiline	Bedaquiline	
Levofloxacin	Levofloxacin	Levofloxacin
Clofazimine	Clofazimine	Clofazimine
Pyrazinamide	Pyrazinamide	Pyrazinamide
Ethambutol	Ethambutol	Ethambutol
High dose isoniazid		
Ethionamide		

Fixed dose combination (FDC) dosage chart 00:54:12

FDC dosage chart for pulmonary drug sensitivity TB has 5 weight bands for adults.

1 FDC contains :

H : 75 mg.

R : 150 mg.

Z : 400 mg.

E : 275 mg.

In the intensive phase (2 months of HRZE), 56 doses are given.

In the continuation phase (4 months of HRE), 112 doses are given.

FDC Dosage chart for Pulmonary DSTB adult weight bands

Weight category	Intensive Phase		Continuation Phase	
	Number of FDC tablets	Number of strips (56 Doses)	Number of FDC tablets	Number of strips (112 Doses)
25-34 Kg	2	4	2	8
35-49 Kg	3	6	3	12
50-64 Kg	4	8	4	16
65-75 Kg	5	10	5	20
> 75 Kg	6	12	6	24

1 FDC
HRZE contains : 75/150/400/275 mg respectively per tablet.
HRE contains 75/150/275 mg respectively per tablet.

FDC dosage chart for pulmonary drug sensitivity TB has 6 weight bands for children.

1 FDC contains :

H : 50 mg.

R : 75 mg.

Z : 150 mg.

E is given separately : 100 mg.

It is different for different age groups.

In the intensive phase (2 months of HRZ and E), 56 doses are given.

In the continuation phase (4 months of HR and E), 112 doses are given.

Treatment regimen – daily FDC regimen for children (<18 years)

Weight category	Type of case	Number of tablets to be consumed			
		Intensive phase		Dose in Ip	3 FDC No. of strips and tabs in IP
		HRZ (3 FDC-P) 50/75/150 mg per tab	E 100mg		
4–7 Kg	New and previously treated	1	1	56 doses	2 x 28s E-56
8–11 Kg		2	2	56 doses	4 x 28s E-112
12–15 Kg		3	3	56 doses	6 x 28s E-168
16–24 Kg		4	4	56 doses	8 x 28s E-224
25–29 Kg		3 + 1 A	3	56 doses	6 x 28s E-168 A-56
30–39 Kg		2 + 2 A	2	56 doses	4 x 28s E-112 A-112

Number of tablets to be consumed			
Continuation phase		Dose in IP	3 FDC No. of strips and tabs in CP
HR (2 FDC-P) 50/75mg per tab	E 100mg		
1	1	112 doses	4 x 28s E-112
2	2	112 doses	8 x 28s E-224
3	3	112 doses	12 x 28s E-336
4	4	112 doses	16 x 28s E-448
3 + 1 A	3	112 doses	12 x 28s E-336 A-112
2 + 2 A	2	112 doses	8 x 28s E-224 A-224

Dosage of shorter oral Bedaquiline-containing MDR/RR-TB regimen drugs for adults (4 weight bands)

SN	Drugs	16–29 Kg	30–45 Kg	46–70 Kg	>70 Kg
1	High dose H (H^h)	300 mg	600 mg	900 mg	900 mg
2	Ethambutol (E)	400 mg	800 mg	1200 mg	1600 mg
3	Pyrazinamide (Z)	750 mg	1250 mg	1750 mg	2000 mg

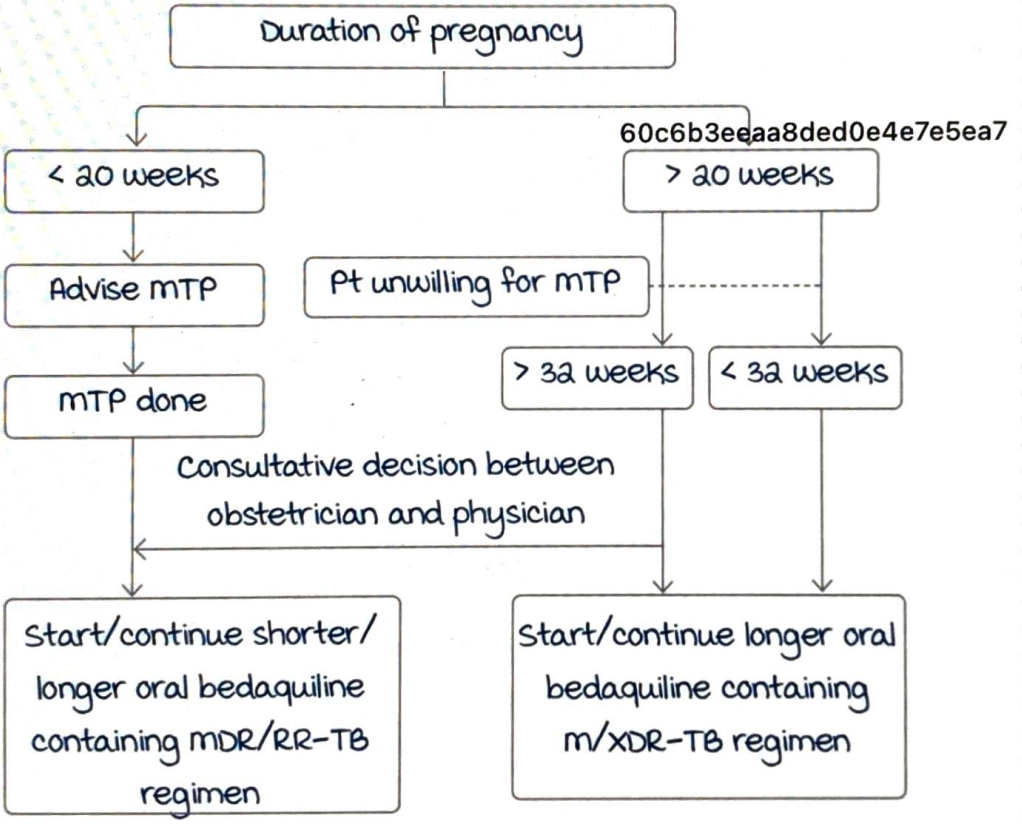
Active space

4	Levofloxacin (Lfx)	250 mg	750 mg	1000 mg	1000 mg
5	Bedaquiline (Bdq)	Week 0-2 : Bdq 400 mg daily Week 3-24 : Bdq 200 mg 3 times per week			
6	Clofazimine (Cfz)	50 mg	100 mg	100 mg	200 mg
7	Ethionamide (Eto)	375 mg	500 mg	750 mg	1000 mg
8	Pyridoxine (Pdx)	50 mg	100 mg	100 mg	100 mg

Pregnancy and TB

01:00:12

Bedaquiline is contraindicated in pregnancy and pregnant mother is advised for MTP.
However, it is still given because TB is a public health disease.



BPaL regimen (Bedaquiline Pretomanid Linezolid regime) :

- Advocated by WHO.
- Under operational research.
- Taken up by few districts in India under NTEP.
- Given if there is fluoroquinolone resistance and no exposure (or less than 2 weeks exposure) to Bedaquiline/Linezolid.

Dosage in BPaL regimen :

- Pretomanid : 200 mg once daily for 26 weeks
- Bedaquiline : 400 mg once daily for the first 2 weeks of treatment (days 1-14) and then 200 mg three times a week for 24 weeks
- Linezolid : 1200 mg once daily for 24 weeks (after 1 month, dose and duration modification for linezolid is permissible), with an option to extend treatment to 39 weeks if they were culture-positive at week 1

Inclusion criteria for Bedaquiline/Delamanid :

- Patient aged > 6 years having MDR/Rifampicin resistant TB.
- Non pregnant females.
- Patients with controlled stable arrhythmia/no cardiac disease.

Exclusion criteria for Bedaquiline/Delamanid :

- Pregnancy and lactating mother.
- Cardiac arrhythmia, conduction abnormality, prolonged QTcF > 500 ms.
- History of additional risk factors for torsades de pointes. Example : Heart failure, hypokalemia, family history of long QT syndrome.

Side effects of newer drugs :

Drug	Side effects
Linezolid	Anaemia, thrombocytopenia, peripheral neuritis and optic neuritis
Cycloserine	Seizure disorder, severe depression
Clofazimine	Dark brown discoloration of skin
Bedaquiline	Electrolyte imbalance, cardiac failure, precipitation of arrhythmia.

Pre treatment evaluation for MDR/RR TB patients :

1. Complete blood count (Hb, TLC, DLC, platelet count).

2. B. urea & S. creatinine.
3. Urine pregnancy test (in women of reproductive age group).
4. Liver function tests.
5. Thyroid stimulating hormone levels to assess the thyroid function (TSH levels alone are usually sufficient to assess the thyroid function of the patient).
6. Urine examination : Routine and microscopic.
7. ECG (if on Mfx, Bdq, Cfz or Dlm).
8. Audiometry (only if on injectable).
9. Serum electrolytes (Na, K, Mg, Ca) only for new drugs.
10. S. protein (Albumin, globulin and total proteins) (only if on Dlm).
11. Ophthalmologist opinion : rule out chorioretinitis/uveitis (only if on linezolid).
12. Psychiatric/surgical/any other evaluation if required.

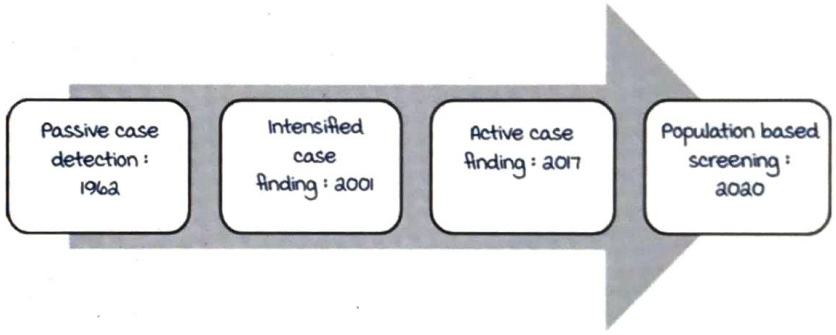
NTEP : NEW STRATEGIES, ORGANISATION AND EVALUATION

India TB report 2022 : Released on march 24, 2022.

60c6b3eeaa8ded0e4e7e5ea7

Case finding

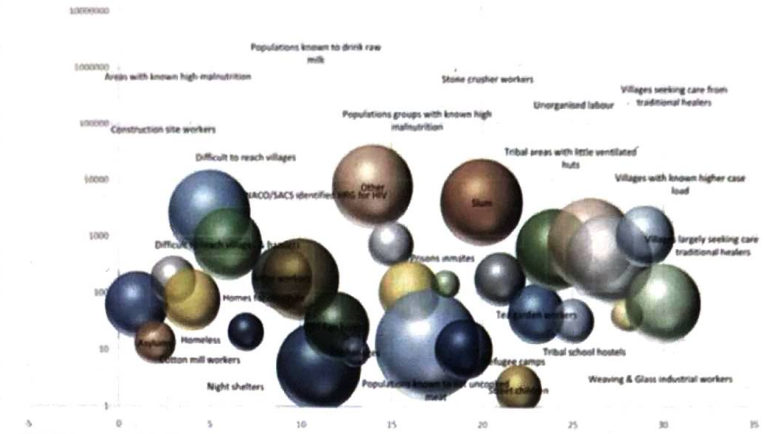
00:01:05



Passive case finding	Intensified case finding	Active case finding
Patients with symptoms of TB voluntarily seek health care	This is a provider initiated screening of outpatient clinic/hospital attendees for symptoms of TB	Actively searching for TB patients among poulation at higher risk of TB in the community
The medical officer follows diagnostic algorithm for evaluating TB patients	TB screening for patients attending health facilities with comorbidities	

Active space

Vulnerable groups/high risk groups :



Representative Graph of various Vulnerable Groups screened during Active Case Finding - 2020

Clinical	Social	Geographical
Clients attending HIV care settings	Prisoners	Urban slums
Substance abuse including smokers	Occupations with risk of developing TB (mines, coal industry, sand blasting industries, weaving & glass industries, stone crushers, cotton mill workers, garden workers, rice mill workers etc.,)	Hard to reach areas
People with comorbidities such as : 1. Diabetes mellitus 2. Malignancies 3. Patients on dialysis 4. Long term immunosuppressant therapy	People in congregate settings : Night shelters, de-addiction centres, old age homes	Indigenous and tribal populations
Healthcare workers		
Household and workplace contacts		
Patients with past history of TB		
Malnourished people		
Antenatal mothers attending ANC clinics/MCH clinics		

Incentives under NTEP :

Scheme	Beneficiary	Incentive
Nikshay poshan yojna	Confirmed TB patients DSTB & DRTB : Public + Private sector patients	Rs. 500 per month
Tribal support scheme		Rs. 750 one time

Active space

Treatment supporter	Treatment Supporter Honorarium	1. Rs. 1,000 for DS TB patients 2. Rs. 5,000 for DR TB patients
Incentive for notification and outcomes	Private Heath Facilities : 1. Practitioner/clinic etc., (single) 2. Hospital/clinic/nursing Home etc., (multi) 3. Laboratories, chemists	1. Rs. 500 as informant or notification incentive 2. Rs. 500 for outcome declaration

IT enabled HMIS

00:07:24

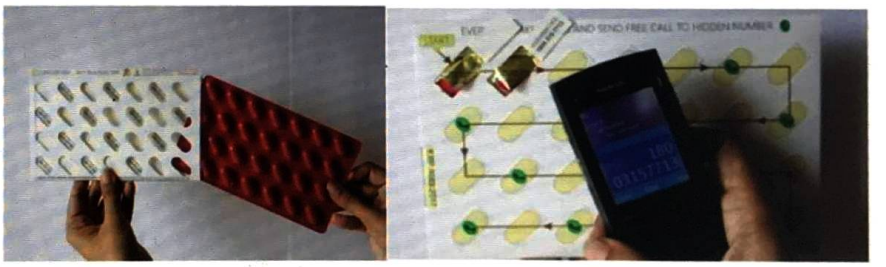
Information technology enabled use of Health Management and Information Systems (HMIS).

Nikshay :

- NIC : National Informatics Center.
- Kshay : TB in Hindi.

Online software system for TB reporting and compliance of treatment.

99 DOTS :



On opening the foil, there is a toll - free number to which a missed call has to be placed.
Number different for every tablet.
Ensures compliance.

Figure 7.6: MERM Container for shorter/longer oral MDR-TB regimen

MERM container :
Medicine Event Reminder Monitoring systems.
GPS enabled box which detects when the tablets are taken from the container and are informed onto the nikshay portal.

Active space

Sounds an alarm when tablets not taken, and the same is displayed in the nikshay dashboard, so that follow up is done. System to increase compliance.

Prophylaxis of TB :

DOC : Isoniazid 300 mg OD X 6 months.

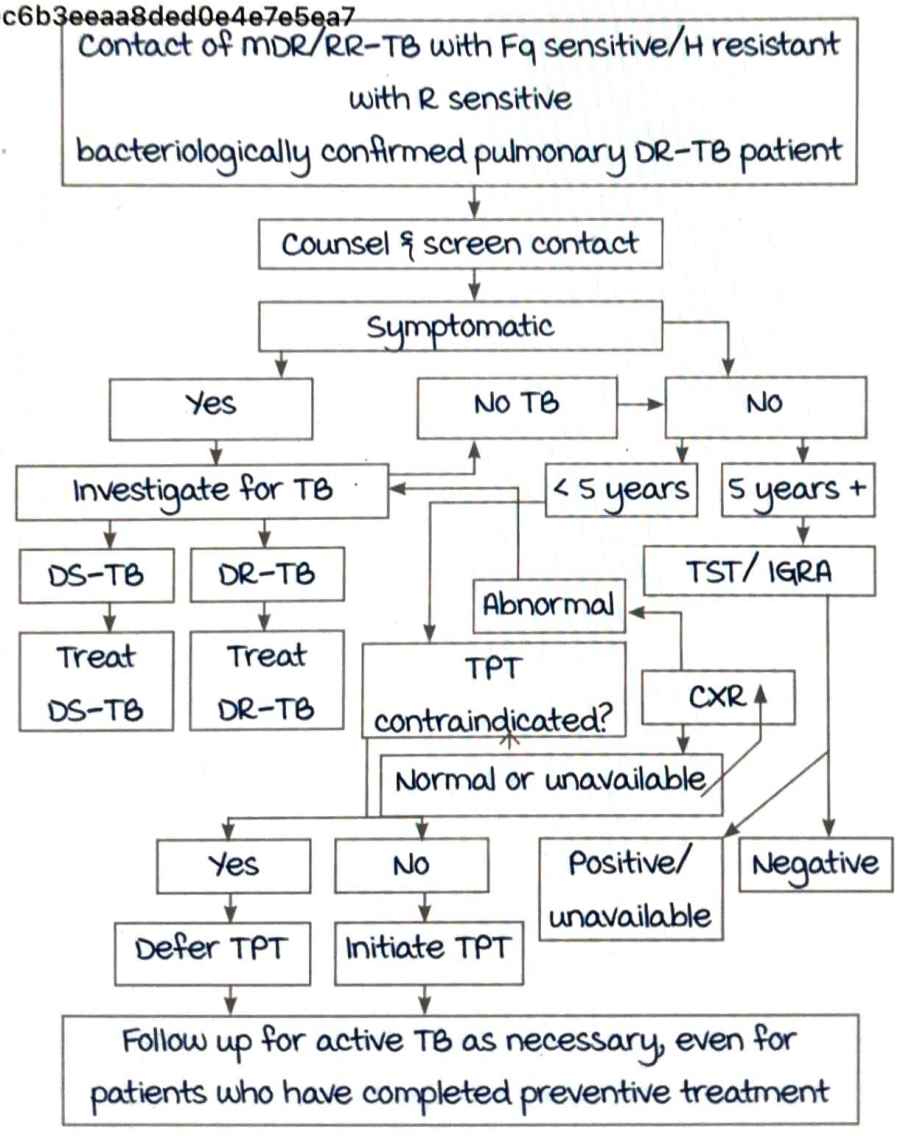
TB preventive treatment (TPT) :

- For those who cannot afford or do not want to take 6 months of Isoniazid.

  Short TPT : 3 months of weekly Rifapentine and Isoniazid (3HP). For drug sensitive TB contact.

For MDR TB contact :

60c6b3eeaa8ded0e4e7e5ea7



Active space

Treatment of MDR TB contacts :

Contacts of	Prophylactic TB treatment
Drug sensitive TB	• 6 months of INH prophylaxis. • Short TPT : 3 months of weekly Rifapentine and Isoniazid (3HP) is recommended as an alternative to 6H.
R resistant, FQ sensitive	Six months of daily Levofloxacin (6Lfx)
H resistant, R sensitive	Four months of Rifampicin daily (4R)

Regimen	Dose by age and weight band
Six months of daily Levofloxacin (6Lfx) for contacts of R resistant FQ sensitive patients	Age > 14 years, by body weight : < 45 Kg. 750 mg/day : ≥45 Kg. 1 g/day Age < 15 years (range approx 15–20 mg/kg/day). By body weight : 5–9 Kg : 150 mg/day 10–15 Kg : 200 300 mg/day 16–23 Kg : 300 400 mg/day 24–34 Kg : 500–750 mg/day
Four months of Rifampicin daily (4R) for contacts of H resistant R sensitive patients	Age 10 years & older : 10 mg/kg/day, Age <10 years : 15 mg/kg/day (range : 10–20 mg)

R : Rifampicin; FQ : Fluoroquinolones; H : Isoniazid.

TB prophylaxis in eligible population 00:16:38

In people living with HIV :
Given to all adults and adolescents.

Isoniazid 300 mg + Pyridoxine 50 mg daily for 6 months, after ruling out TB.
In children of 1 - 10 years of age : Isoniazid 10 mg/kg body weight + Pyridoxine 25 mg daily for 6 months.

- In HIV and TB co infection :
  After completing TB treatment, 6 months of Isoniazid is continued.
- All children < 5 years of age, who are close contacts of TB.
- All tuberculin test positive children on immunosuppressive therapies.
  Short TPT or Isoniazid for 6 months.
- Child born to mother tested positive for TB during pregnancy, after ruling out congenital TB.

Biomedical waste (BMW) handling :
Sputum :

- Best disinfectant at health facility level : 5% phenol, to be left for 12 hours.
- Best way to dispose at household level : Burning.

Sharps and slides :

- In rural area : Placed in a plastic container or red bag.
  Autoclaved at 121°C, for 15 min in 15 psi.
  Disposed in sharp pits after autoclave.
- In urban centers : Disposed by Common Biomedical Waste Treatment Facility (CBWTF) as per guidelines.

Researches in tuberculosis 00:23:17

TB CHAMP :
Testing six months of Levofloxacin (Lfx) vs placebo in infants and young children less than five years of age exposed to MDR-TB.

(South Africa, ongoing recruitment and intending to publish by end 2021).

60c6b3eeaa8ded0e4e7e5ea7

V-QUIN :

Testing 24 weeks of Lfx vs placebo in all ages with evidence of infection.

Vietnam, recruitment completed, date of ending data collection is March 2022.

PHOENIX :

Testing 26 weeks of Delamanid vs Isoniazid in all ages.

11 countries, estimated completion in mid - 2025.

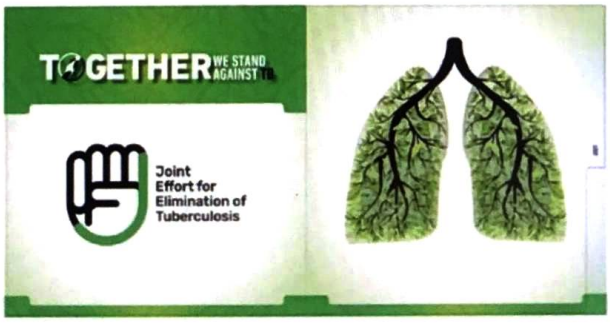
Public - private partnership in TB :

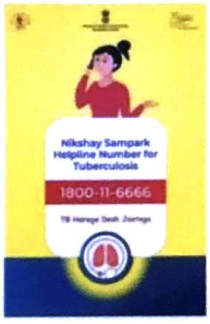
1. JEET : Collaboration by the doctors, for the doctors.

   Promote Tb awareness amongst the doctors about :

   - Diagnostic modalities.
   - Incentives.
   - Treatment modalities.

2. Project ECHO : For improving quality training in tuberculosis.
3. SHIS : Southern health improvement samity : Higher funding options.
4. Saksham : By TATA institute of social sciences.
5. NISHTHA - USAID - to integrate AB HWC with NTEP.
6. National TB sampark helpline : Controlled by Government of India.



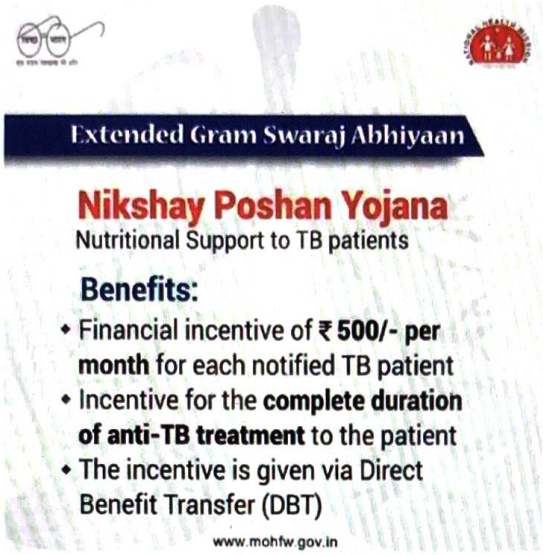


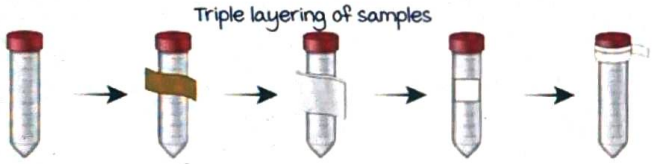
Active space

Nutritional support :

Nikshay poshan yojana.

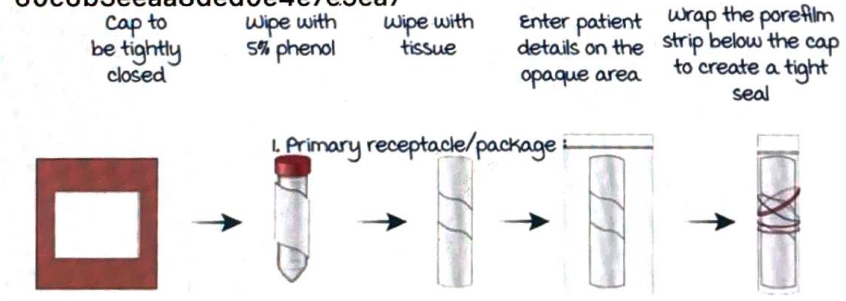
Rs. 500 per month via direct benefit transfer (DBT).



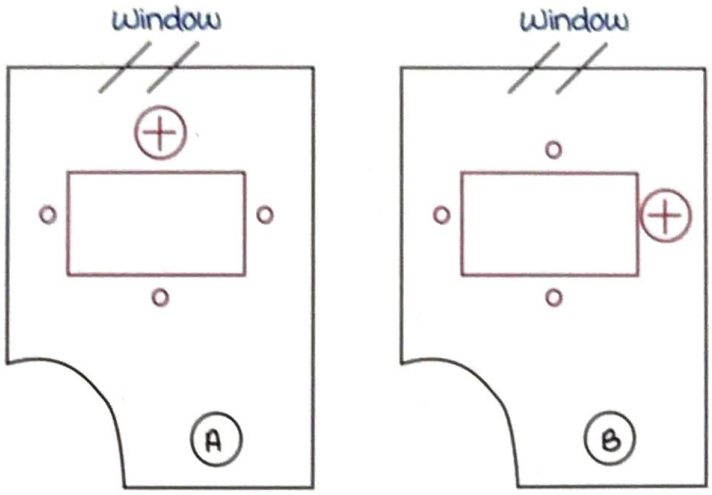


Infection control :

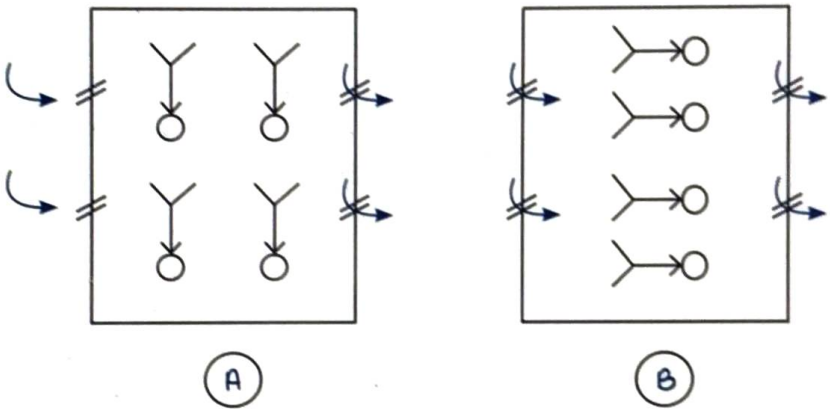
60c6b3eeaa8ded0e4e7e5ea7



Active space



While planning an OPD, better option is option B, so that the flow of air from door to window is unobstructed.



In a ward, it would be better to have option B so that inter- person transmission is less.

TB notification

00:29:17

In the year 2012, TB was declared as a notifiable disease, under the epidemic disease act section of IPC 269 and IPC 270.

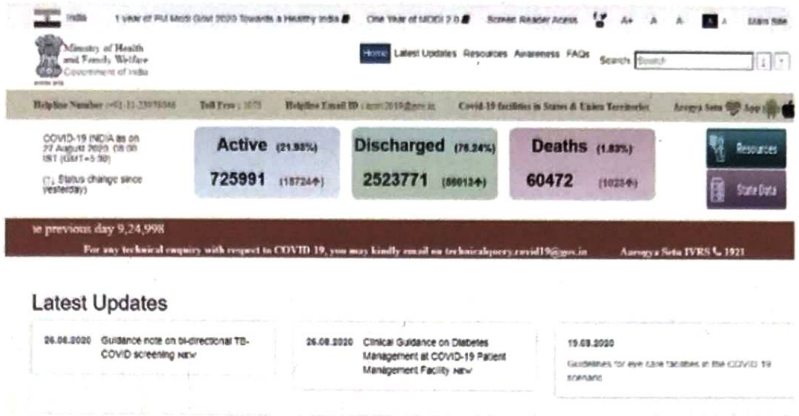
Should be done within 30 days of diagnosis or start of treatment.

Bidirectional screening in TB :

- Bidirectional TB - COVID screening.
- In influenza like illness (ILI) cases.
- In severe acute respiratory illness (SARI) cases.

Active space

- In diabetes mellites cases.
- In HIV cases.



Indian TB Genomic Surveillance consortium (InTGS) :
Announced on 24 March, 2022.
Genomic sequencing of TB bacilli to find different types of mutation.
Started by NTEP.

DT3 centres :
Difficult to treat TB centres.
Early diagnosis and management of drug resistant TB.
In association with NITRD, CTD, NTF.

- NITRD : National institute of TB and Respiratory Diseases, Delhi.
- CTD : Central TB Division, Delhi.
- NTF : National Task Force.

Other strategies 00:33:52

- Injection free treatment regimen for DS-TB implemented across the country.
- Ayushman Bharat engaged with Health and wellness centres.
- Programmatic Management of Drug resistant TB (PMDT) guidelines.
- Shorter oral Bedaquiline (Bdq) containing MDR/RR-TB.
- Use of Bdq expanded to children from 5 years of age, weighing 15 kg and above, and pregnant women.
- Access to free drugs including newer drugs.

- Difficult to treat TB clinics.
- DR-TB centre in Medanta Hospital, Gurugram, Haryana.
- Establishment of DR-TB centres in all medical colleges.

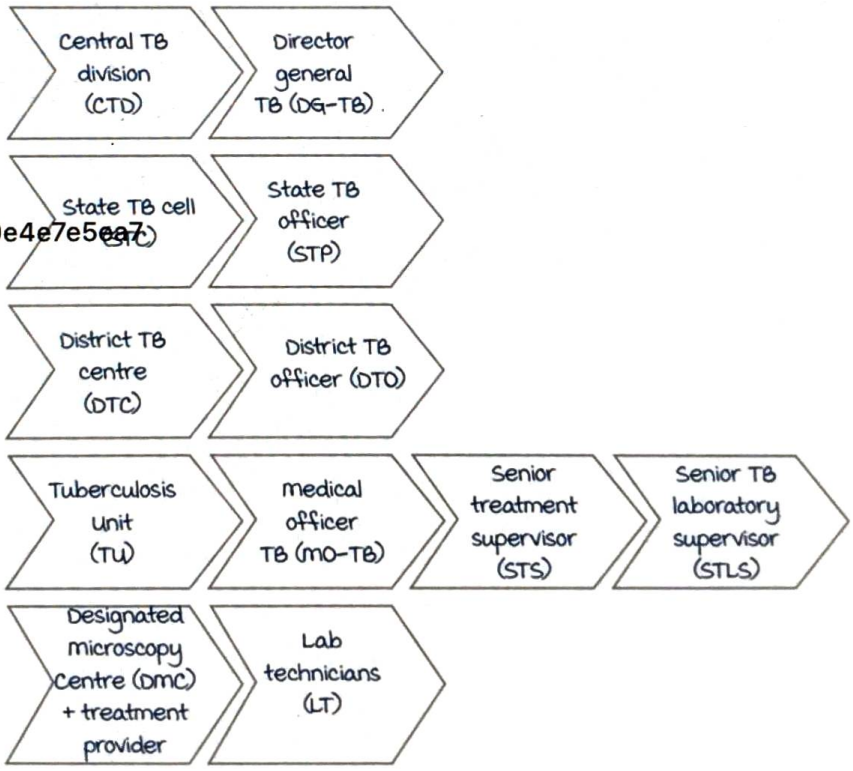
DareaeraD TB : Dare to erad TB.
NTEP determined to end TB by 2022.
Use of artificial intelligence.

- Predicts loss of follow ups.
- LPA reports.

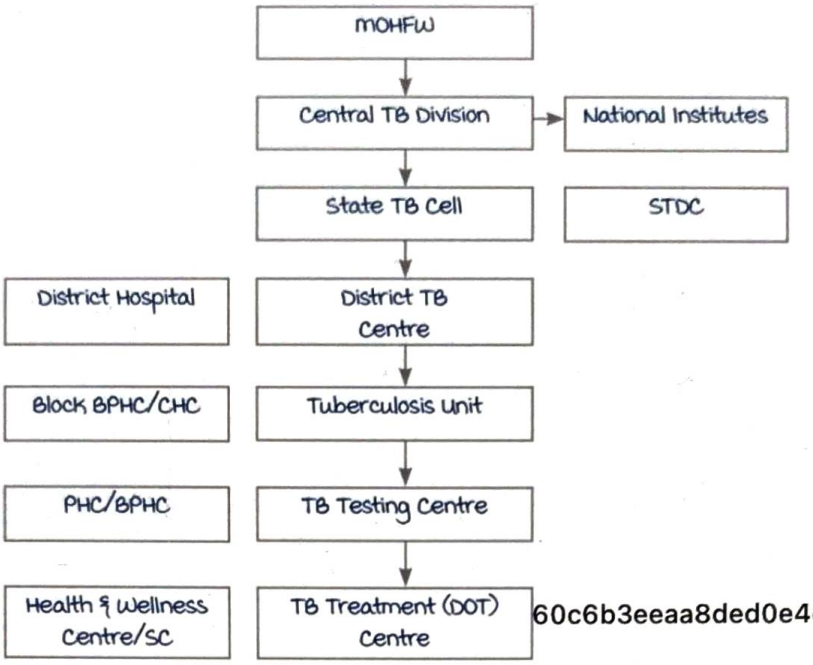
TRACE - TB project :
Transformative Research and Artificial intelligence Capacity for Elimination of TB and responding to infectious diseases.

NTEP target : 90% reduction in death and 80% reduction in incidence of TB by 2025.

Organisation :



Integrations of NHM and NTEP :



60c6b3eeaa8ded0e4e7e5ea7

STLS : Supervises the laboratory technicians.

STS : Supervises the treatment providers.

1 DMC for every 50,000 population.

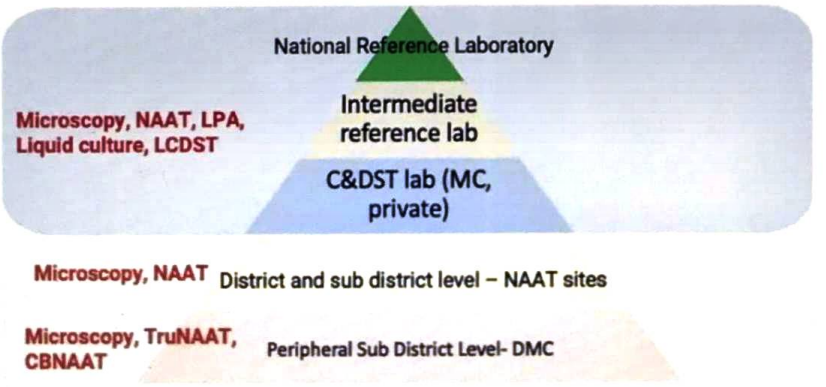
1 TU for every 1-2 lakh population.

2 - 4 DMCs under one TU.

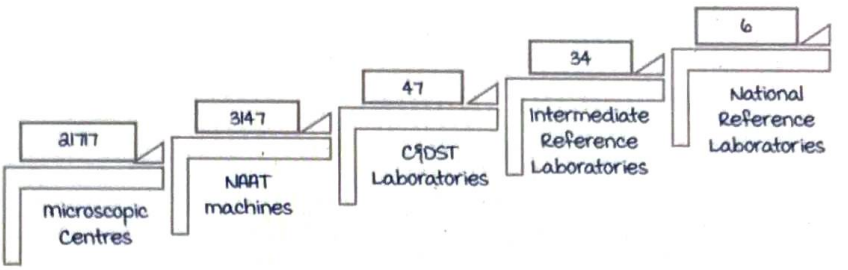
Integration of laboratories 00:42:59

microscopy and CB - NAAT are available is all centres at district level.

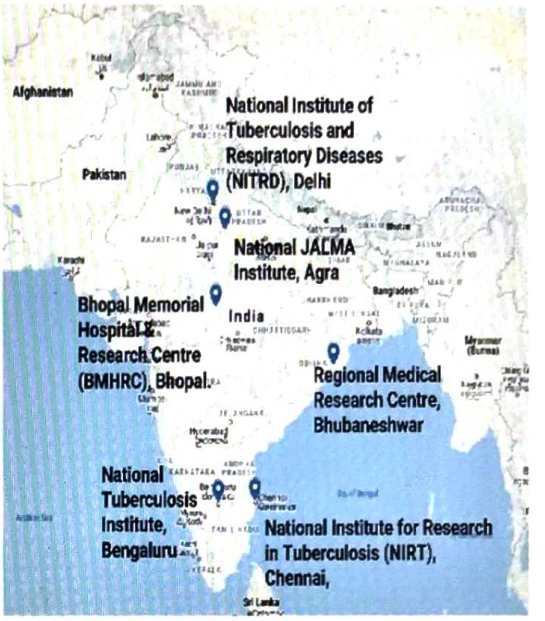
Intermediate reference laboratory (IRL) supervise the STLS and take care of the CBNAAT machines.



C & DST laboratories and intermediate reference laboratories are in state level.



6 national reference laboratories in India.



Tuberculosis Unit is the functioning unit.

Administrative unit : District TB centre.

Monitoring and evaluation in NTEP

00:48:02

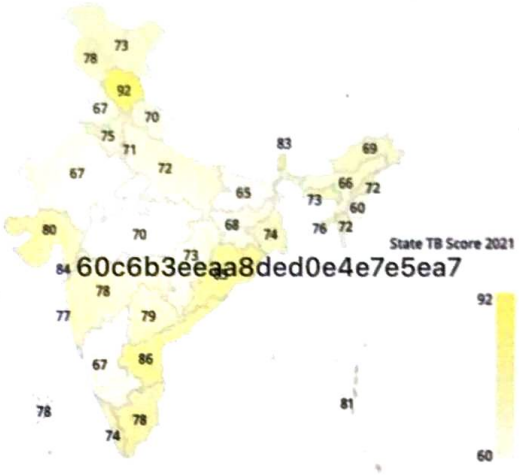
State TB index :

Service indicator
% of target TB notification achieved
% of TB notified patients with known HIV status
% of eligible TB notified patients with UDST done
Treatment success rate
% of diagnosed MDR patients initiated on treatment
% of eligible beneficiaries paid under Nikshay Poshan Yojana
% of expenditure amongst the approved Record of Proceedings (RoP) of the State (FY 2019-20)
% of eligible contact children (< 6 years) given chemoprophylaxis
% of eligible PLHIV given IPT

Quality indicator
Average turnaround time for UDST
Average turnaround time for FL LPA
Average time from diagnosis to treatment initiation for DSTB patients (Nom : within 3 days of diagnosis)
Average time from diagnosis to DR-TB patients initiated (Norm : within 7 days of diagnosis)
Average adherence score ofTB patients (for the past 6 months. This includes those TB patients undergoing treatment as well)
Proportion ofTB patients paid first NPY benefit within 30 days of TB notification.
Proportion of districts that have conducted District TB Forum meetings at least once in the past 6 months.

Active space

State TB Score 2021



Index >75 : Good.

> 65% country in good TB index zone.

Highest : Himachal Pradesh.

Incidence of TB : Best indicator of the burden of TB.

- Best epidemiological marker.
- New TB notifications.

ARTI : Annual Risk of TB infection.

- No longer an epidemiological indicator.

Recent advances :

	Edition 5	Recent updates
TB epidemiology	Similar	MDR/RR TB : 4/Lakh population. Incidence : 188/ Lakh population
Definitions	DSTB, H – mono/poly, RR, MDR, ZDR	Pre XDR TB, XDR
Diagnosis	Sputum, CXR, CBNAAT	CBNAAT is re-inforced, universal testing, incorporating TruNAAT.
Treatment	DS TB, DR TB (shorter MDR, all oral taken longer)	New regime : Shorter oral MDR/ RR TB regime included.

Active space

Contacts	use of TPT for DSTB contacts	TPT for DSTB is same. Shotert TPT : Rifapentine + Isoniazid 3 months. TPT for DR TB includes 4R/ 6Lfx
Indicator	ARTI is not used as indicator, incidence & prevalence of TB is used as indicator.	
Organizational updates	Integration with HWC, enhanced case finding and screening for DR TB.	

Important points :

- Undiagnosed & untreated potential TB patients : Practice caution.
- MC symptom : cough for > 2 weeks.
- Take 2 sputum samples : Spot (a) & early morning (b).
- Sputum to be examined within 2 days of collection and reporting same day.
- & PTB, contacts, PL HIV : Do sputum for cough of any duration.
- 2 - 3% of all new adult OPD will be chest sympomatic & should get sputum done for AFB.
- 10 - 15% of all chest symptomatic and who get sputum done (presumptive TB) are smear positive TB.
  AFB smear grading is essential for quality control & assurance.

NACP - TARGETS, DIAGNOSIS AND MANAGEMENT

NACP : National AIDS Control Program.

NACO : National AIDS Control Organization.

National AIDS Control Organisation
India's Voice against AIDS
Ministry of Health & Family Welfare, Government of India
www.naco.gov.in

Red ribbon : Symbol for HIV/ AIDS.

World AIDS day : 1st December.

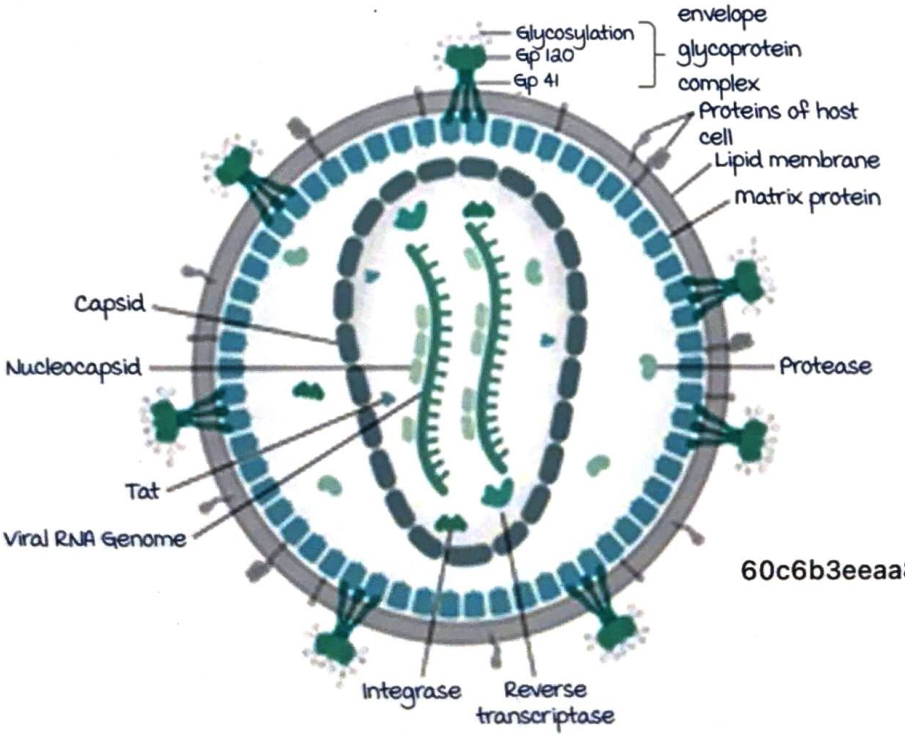
HIV virus : Epidemiological features 00:01:57

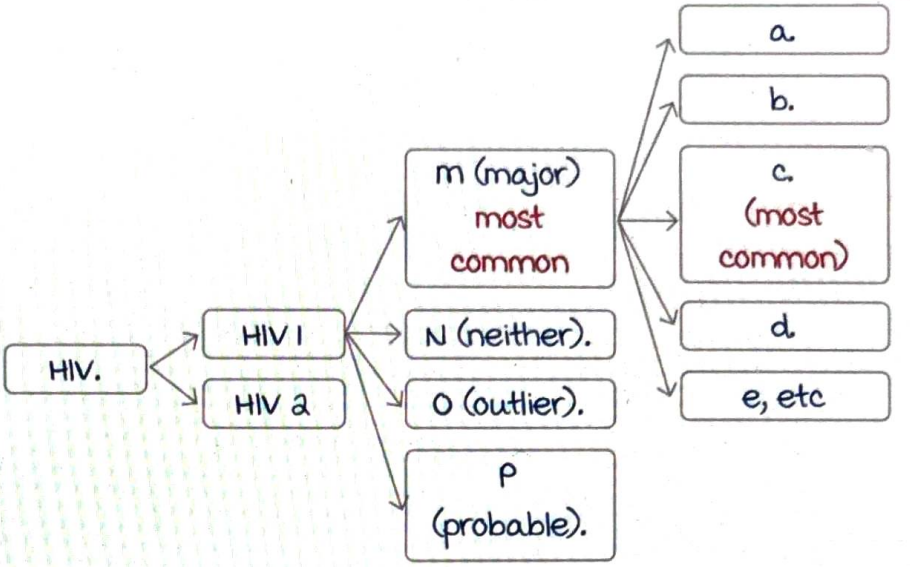
Family : Lentevirus.

Single stranded RNA virus.

Two types : HIV 1 & HIV 2.

Most common is HIV 1.





Sensitive to alcohol/ detergent solvents.
Resistant to radiations.

Modes of transmission :

Route	Efficiency (in %)	Effective mode of transmission (in %)
Blood	90 – 95	5 – 10
Perinatal	20 – 40	5 – 10
Sexual	0.1 – 10	75 – 80
IV drug abuse	< 1	5 – 10
Needle stick injury	0.3	< 1

Most effective mode of transmission : Sexual.
Most efficient mode of transmission : Blood transfusion.

High risk transmission :

- Chances of male to female transmission is higher compared to the opposite.
  Concentration of HIV : Semen >> vaginal secretions.
  Larger area of exposure in females during intercourse.
- Anal intercourse is 3 times more dangerous.
  More chances of abrasions and injuries.
- Menstruating female.
- Adolescents and post menopausal women.
  Mucosal lining is thinner & so risk of transmission is high,
  < 15 years of age, or > 45 years of age.
- Presence of other sexually transmitted diseases
  (more number of T cells in the area).
- Transmission is highest during the window period as the

Active space

Viral load is higher than antibody load.

- Needle stick injury among health care professionals is very less efficient and not a major source of HIV transmission.

Very low viral load in urine.

Almost absent in saliva : Deactivated by the salivary enzymes.

HIV virus : Host and social factor 00:11:54

Host :

Peak age : 20 - 50 years.

No gender predilection.

Social :

Social discrimination present.

more in high risk occupational groups.

Commercial sex workers.

Truck drivers.

Male migrants.

IV drug abusers.

Stages of HIV :

Stage I	Asymptomatic. Generalized lymphadenopathy.
Stage II	Surface infection like oral candidiasis, dermatitis.
Stage III	CD4 count low. Deep tissue infections : • Hepatitis. • Pneumonia. • Pancreatitis. • Pulmonary tuberculosis (most common opportunistic infection).
Stage IV.	Opportunistic infections : • Pneumocystis jirovecii. • CMV retinitis. • Toxoplasmosis. • Cryptococcal infection. • Extra pulmonary tuberculosis. Malignancies : • Non Hodgkin's lymphomas (MC malignancy). • Kaposi sarcoma (strongest association with HIV).

Active space

NACP

00:17:25

National AIDS Control Program.
Started by NACO.
Started in the year 1992, as a vertical program.

Timeline :

Year	NACP
1986	First reported case in India.
1992 – 1999	Phase I of NACP.
1999 – 2006	Phase II of NACP.
2006 – 2011	Phase III of NACP.
2011 – 2017	Phase IV of NACP.
2017 – 2024	National Strategic Plan (NSP) to end AIDS epidemic.

In 2021, it has been merged with National Health Mission.
World AIDS day is on Dec 1st every year.
Theme of world AIDS day, 2021 :

End inequalities.
60c6b3eeaa8ded0e4e7e5ea7
End AIDS.
End pandemics.

WHO 90 – 90 – 90 strategy :

- Out of all HIV infected population, 90% should be diagnosed.
- Out of all HIV patients diagnosed, 90% should be on treatment.
- Out of all HIV patients on treatment, > 90% should have decrease in viral load.

Treat All Strategy : (By WHO)
Every patient to be given ART, irrespective of the CD4 count.

Targets

00:23:17

WHO :

- 90 – 90 – 90 strategy.

Sustainable Development Goals (SDG).

- End HIV/ AIDS epidemic by the year 2030.

NACP :

- > 80% reduction in HIV incidence by year 2024 compared to 2010.

Active space

- 95 – 95 – 95 strategy.
  95% patients should be diagnosed.
  95% patients should be on treatment.
  The patients on treatment, > 95% should have decrease in viral load.

Statistics of HIV epidemiology in India :
Incidence of HIV : 5 cases/ lakh/ year.
Prevalence of HIV :

Prevalence of HIV in ANC females during a sero surveillance are the proxy indicators for HIV prevalence in the country, because the exact numbers are not known, due to inadequate data following the social stigma.
Prevalence of HIV in ANC females : 0.22%.

Diagnosis of HIV

00:27:56

60c6b3eeaa8ded0e4e7e5ea7

Screening tests	Confirmatory tests
• ELISA test. • Immunochromatography. • Lateral flow immuno concentration/ Dot Blot method. • Particle agglutination test.	• HIV DNA RTPCR : IOC in children, usually infants (< 1yr). • qPCR – HIV I : For adults. • Viral isolation/ Viral load estimation. • P24 viral antigen test. • Western blot : Confirmatory test of choice. Highly specific.

Screening of HIV :
ICTC centres : Integrated Counselling and Testing Centres.
Tests done here are ERS :

ELISA test : Most sensitive. Best screening tool.
Rapid test.
Spot test.

ERS done in :

- Blood donation services.
  Any I positive result from ERS tests is labelled as HIV positive blood, and is discarded.
- Symptomatic patients : Persistent diarrhea, chronic fever, moderate to severe weight loss etc.,
  Any 2 out of three positive is HIV positive, and is sent for confirmation.

Active space

- Asymptomatic patients.
  No clinical symptoms. But if all 3 ERS tests are HIV positive, sent for confirmatory tests.

Northern blot : RNA testing.
Southern blot : DNA testing.
Western blot : Protein testing.
Eastern blot : Enzyme testing.

CD4+ count :
Reliable test to assess the response to treatment and progression of disease.
Best test to asses response to treatment is quantitative viral load estimation.

Management of HIV

00:38:55

Treatment services for HIV :

Category	First line		Second Line
Adults and adolescents	Preferred	Tenofovir + Lamivudine + Dolutegravir.	AZT + 3TC + ATV/r (or LPV/r).
	Alternate	TDF + 3TC + EFV 400.	AZT + 3TC + DTG.
Children	Preferred	Abacavir + Lamivudine + Dolutegravir.	AZT + 3TC + LPV/r.
	Alternate	ABC + 3TC + LPV/r.	AZT (or ABC) + 3TC + DTG.
Neonates	Preferred	Zidovudine + Lamivudine + Raltegravir (Lopinavir/ Ritonavir combination).	AZT (or ABC) + 3TC + DTG.
	Alternate	AZT + 3TC + NVP.	ABC + 3TC + DTG.

TDF : Tenofovir.
3TC : Lamivudine.
DTG : Dolutegravir.
EFV : Efavirenz.
LPV/r : Lopinavir/ Ritonavir combination.
RAL : Raltegravir.
NVP : Nevirapine.
AZT : Zidovudine.
ATV : Atazanavir.
ABC : Abacavir.

Prevention of mother to child transmission (MTCT)

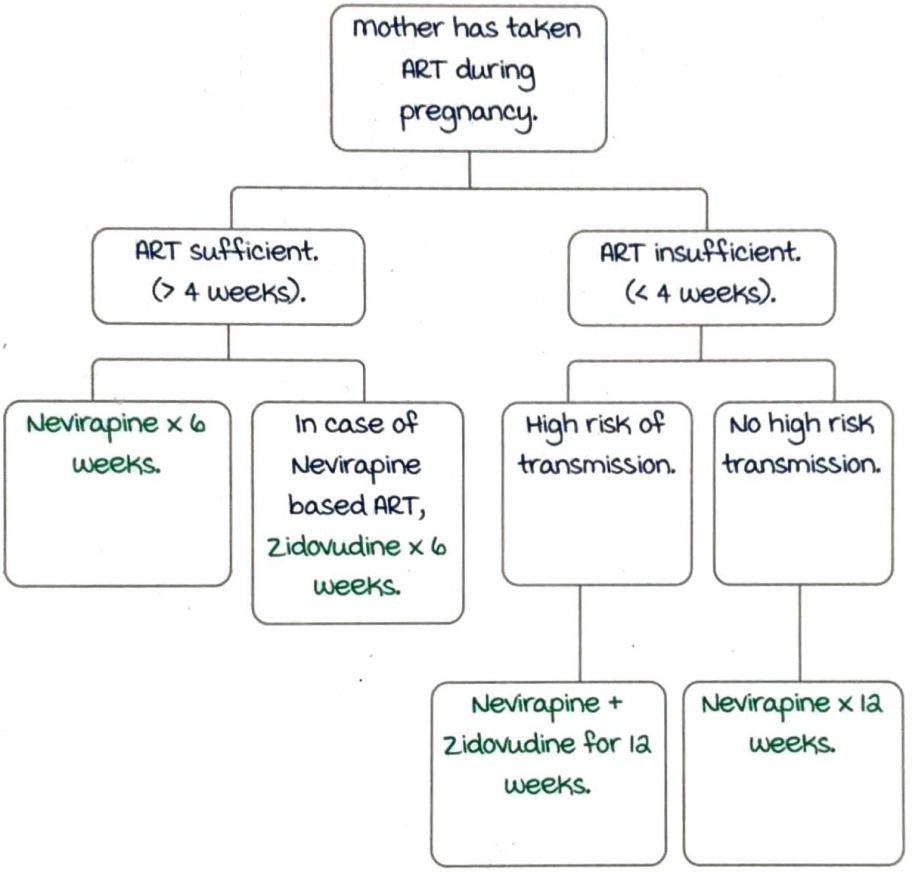
00:41:30

Child exposed to HIV = Child born to HIV positive mother.

Nevirapine : DOC to prevent MTCT.

Dose : 10mg once daily for 6 weeks.

In case the mother took Nevirapine based ART during the pregnancy, Zidovudine is given, due to development of archived Nevirapine resistance.



After 6 weeks, Early Infant Diagnosis (EID) is done.

HIV DNA RTPCR is the IOC.

If positive : ART is started.

If negative : Follow up every 6 months upto 2 years.

Breast feeding

00:51:29

If the child is HIV positive, breastfeeding continued for 2 years.

If the child is HIV negative, breastfeeding is given for 1 year.

Despite the chance of transmission, it is given to prevent the immunodeficiency from not giving it.

Avoid abrupt stopping of breast milk.

Avoid abrupt changes in type of milk given (formula milk and breast milk).

Post exposure prophylaxis (PEP) :

Needle stick injury : Primary level of prevention.

Tenofovir + Lamivudine + Dolutegravir.

< 2 hours of exposure.

For 28 days, once daily (preferred at night).

Prophylaxis for Tuberculosis :

Isoniazid Preventive Therpay (IPT) :

Given for all people living with HIV (PLHIV), after ruling out TB.

DOC : Isoniazid.

Children (1 – 10 yrs) : Isoniazid 10 mg/kg & Pyridoxine 25mg.

Adults : Isoniazid 300 mg & Pyridoxine 50 mg.

Given for 6 months for everyone.

Contraindicated in :

- Tuberculosis in HIV.
- Hepatitis.
- MDR contact.

Prophylaxis of Pneumocystis jirovecii :

Primary prophylaxis : Cotrimoxazole Preventive Therapy (CPT)

CD4 count < 350 cells/mm^3 and/ or

HIV/AIDS stage III or IV.

Drug : Double strength Cotrimoxazole (TMP/SMX) tablets.

Trimethoprim (TMP) : 160mg &

Sulfamethoxazole (SMX) : 800mg.

Stop : When CD4 count > 350 cells/mm^3 &

no HIV stage III or IV.

Secondary prophylaxis is given when the patient has a Pneumocystis jirovecii infection.

Double strength Cotrimoxazole for 3 weeks.

Even if the CD4 count >350 cells/mm^3.

NACP- STRATEGIES, ORGANISATION AND INDICATORS

Integrated Counselling and Testing Centers (ICTC)

00:00:49

Types of ICTC :

- Stand alone ICTC (SA-ICTC).
  District and above levels.
  For a large population.
- Facility integrated ICTC (F-ICTC).
  Low case load.
- Mobile ICTC.

HIV sentinel surveillance :

Surveillance activity to find the missing cases, which is in the bridge population.

e.g. : An HIV positive commercial sex worker infects clients, one of whom may infect other commercial sex workers. The client who transmits between the two high risk population, falls under bridge population.

HIV sero surveillance :

To assess the real burden of HIV.

The HIV prevalence in a sample population is extrapolated.

The last sero surveillance was done in 2016 - 17.

One sample site was divided into three groups.

High risk groups	Bridge population	General population
• Female sex workers. • Those engaging in male to male sexual activities • IV drug abusers. • Transgenders.	• Single male migrants. • Long distance truck drivers.	Pregnant females are taken as proxy indicators, after taking informed consent.

Active space

Duration : 3 months

Frequency : Every 2 years.

In 15- 49 years age group.

Testing strategy : Unlinked anonymous testing.

Two test protocol.

Sample size :

High risk and bridge population : 250 each.

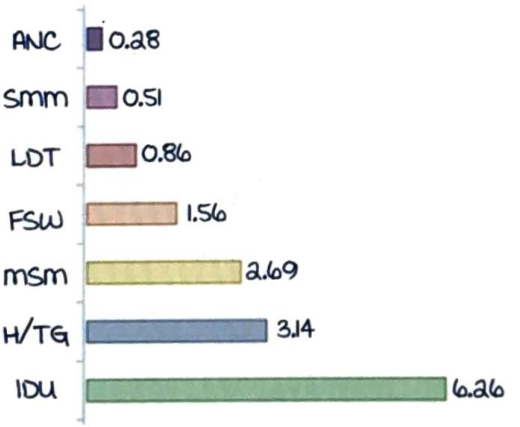
Pregnant females : 400.

60c6b3eeaa8ded0e4e7e5ea7

Total of 900.

Book enumerating the guidelines in NACP : Sankalk.

HIV sero surveillance 2016 - 17 data :



Highest in IV drug abusers (highly transmitting cluster).

ANC is taken as the proxy indicator for general population.

HIV & TB coordination

00:10:21

Bidirectional testing : All cases of HIV are tested for TB, and vice versa.

In all cases of HIV, IPT prophylaxis is given (Isoniazid

Active space

Preventive Treatment).

In all cases of HIV and TB, ATT is always started first as TB is airborne disease.

- Chance of Severe Immune Reconstitution Syndrome (SIRS) if TB treatment is not started first.
  Rifampicin is substituted with Rifabutin, due to drug interactions.
  First line investigation of choice : CBNAAT.
- In case of HIV positive patients, less chance of cavitation and sputum positivity.

Immunization in HIV positive (immunodeficient state) child :

All vaccines are given as per schedule.

Live vaccines are avoided in severe immunodeficiency :

- If CD4 count is < 15% (relative).
- Absolute CD4 count is < 200 cells/mm^3.
- Stage III/IV or any symptom.

Rabies vaccine in HIV :

In case of animal bites, it is recommended to take IM injections than ID injections.

Human rabies IG is advised in both class II and class III bites.

Suraksha clinics 00:18:49

Treatment of RTI/STI.

Free treatment.

Clinic established for infectious disease : Suraksha clinic.

Treatment provided in suraksha clinic is syndromic management.

Here, the behaviour of the client is changed.

Syndromic case management protocol

Kit No.	Syndrome	Colour	Contents
Kit 1	Urethral discharge (UD), cervical discharge (CD), anorectal discharge (ARD) painful scrotal swelling (PSS) presumptive treatment (PT).	Grey	Tab. Azithromycin 1 g (1) § Tab. Cefixime 400 mg (1)
Kit 2	Vaginal discharge (VD)	Green	Tab. Secnidazole 2 g (1) § Tab. Fluconazole 150 mg (1)
Kit 3	Genital ulcer disease : Non herpetic (GUD-NH)	White	Inj. Benzathine Penicillin 2.4 mu (1) § Tab. Azithromycin 1 g (1) and Disposable syringe 10 ml with 21 gauge needle (1) and Sterile water 10 ml (1)
Kit 4	Genital ulcer disease : Non herpetic (GUD - NH) for patients allergic to Penicillin.	Blue	Tab. Doxycycline 100 mg (30) § Tab. Azithromycin 1 g (1)
Kit 5	Genital ulcer disease : Herpetic (GUD - H)	Red	Tab. Acyclovir 400 mg (21)
Kit 6	Lower abdominal pain (LAP/PID)	Yellow	Tab. Cefixime 400 mg (1) § Tab. Metronidazole 400 mg (28) § Tab. Doxycycline 100 mg (28)
Kit 7	Inguinal bubo (IB)	Black	Tab. Doxycycline 100mg (42) § Tab. Azithromycin 1g (1)

Mnemonic for the Kits : Good Girl With Blue Red Yellow Bag.

Other strategies

00:28:43

Condom promotion :

- Under NACO, Nirodh and Deluxe Nirodh condoms are provided for free.
- Female condoms (FCA) : Latex or polyurethane.

Safe blood practices :

- Primary level of prevention.
- Screening tool : Unlinked anonymous testing
  Reports are not linked to the person who donated blood.
  It is used for blood donations § HIV sero surveillance.

Active space

Opt out testing :

All pregnant females in ANC undergo HIV testing, from which they can opt out.

Red ribbon express (train) :

Promotes HIV/AIDS awareness travelling across the country.

Link worker scheme :

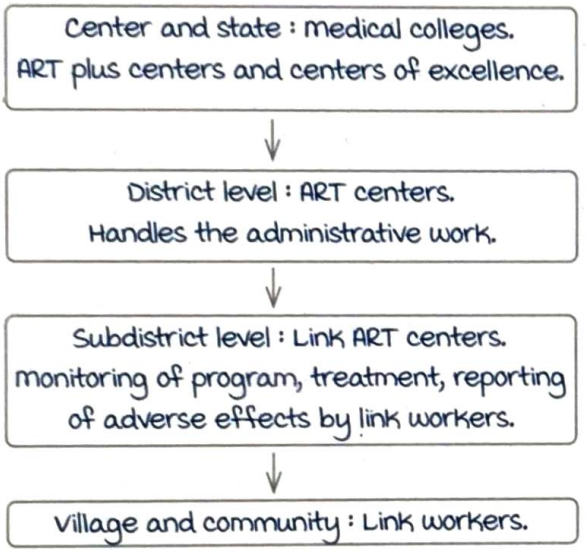
Links the community with the ICTC/ ART centers/ health facilities.

Help in early diagnosis & disseminating awareness of HIV.

Considers the socially discriminating nature of the disease.

Work at community level.

Organization 00:37:40



At all ART centers, First Line Anti Retroviral Therapy (FLART) is received.

At ART plus centers and centers of excellence :

- Alternate FLART : In case of intolerance.
- Second Line Antiretroviral Therapy (SLART).
- Third line ART : Includes Raltegravir and Darunavir.

Subdistrict level : CHC or block hospital.

Laboratory system :

Village & community levels : Mobile ICTC.

District & subdistrict levels : Stand alone/ facility ICTC.

Indicators 00:44:22

- Prevalence of HIV in ANC females.

- Prevalence of HIV in high risk groups.
- Known or unknown hot spots.

District level categorization :

Category	HIV prevalence in ANC females	HIV prevalence in high risk groups	Hot spots
A	> 1%.	-	-
B	< 1%.	> 5%.	-
C	< 1%.	< 5%.	Known
D	< 1%.	< 5%.	Unknown or no Known.

Recent advances :

Vaccines for HIV :

- rAAV vaccine : Recombinant Adeno Associated vaccine.
  Known as Ankara vaccine (under trial).
- Based on P24, recombinant particle based vaccine.
- GP_{140} core protein vaccine.

Syringe distribution centers :

Free syringes to decrease the transmission of HIV by IV drug abuse.

Surveillances available :

- Sero surveillance : Burden of HIV.
- Sentinel surveillance : Missing cases.
- AIDS case surveillance : At health worker level.
- Behavioral surveillance : In educational institutes.
  To decrease future HIV transmission in the country.

Projects launched :

- Sunrise project : In North eastern states.
  Highest burden in Meghalaya, Nagaland and Manipur.
  Decrease IV drug abuse.
  Promote safe sexual practices.
- Nirantar project :
  Southern states (Andhra Pradesh, Telangana, Maharashtra, Karnataka).
  Maximum no. of people living with HIV is in Maharashtra.

HIV status report : Sankalk booklet (downloaded from NACO website).

MALARIA EPIDEMIOLOGY

Malarial parasite : Discovered by Dr. Alphonse Leveran (1880–1882).

Malarial transmission :

Discovered by Sir Ronald Ross (20 August 1897).

He discovered that transmission of malaria was by vector : Anopheles mosquito.

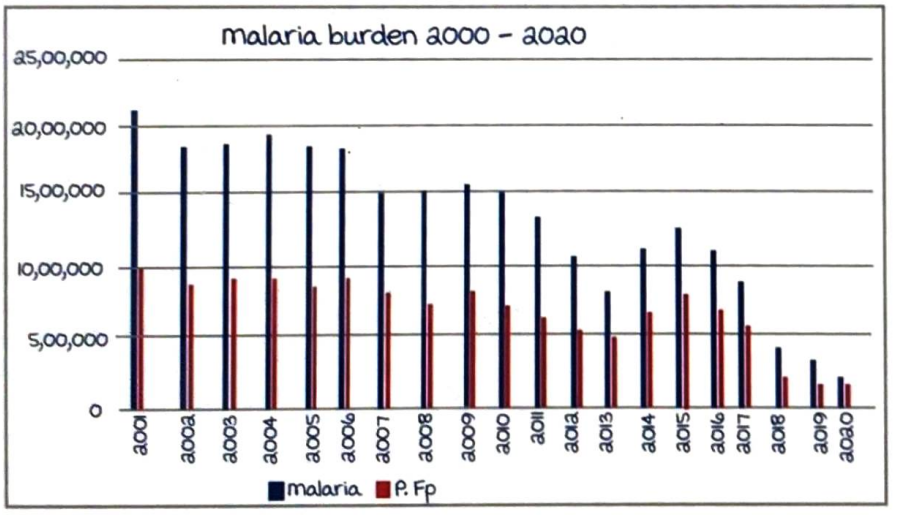
Sir Ronald Ross

60c6b3eeaa8ded0e4e7e5ea7

Malaria epidemiology

00:02:06

- 2020 : 241 million cases of malaria worldwide.
- Malaria deaths : 6,27,000.
- Africa : 95% of global malaria cases.
- India : 3% of global cases.



P. falciparum infections

Active space

Species :

Malaria is spread by plasmodium species (> 100) :

P. vivax.

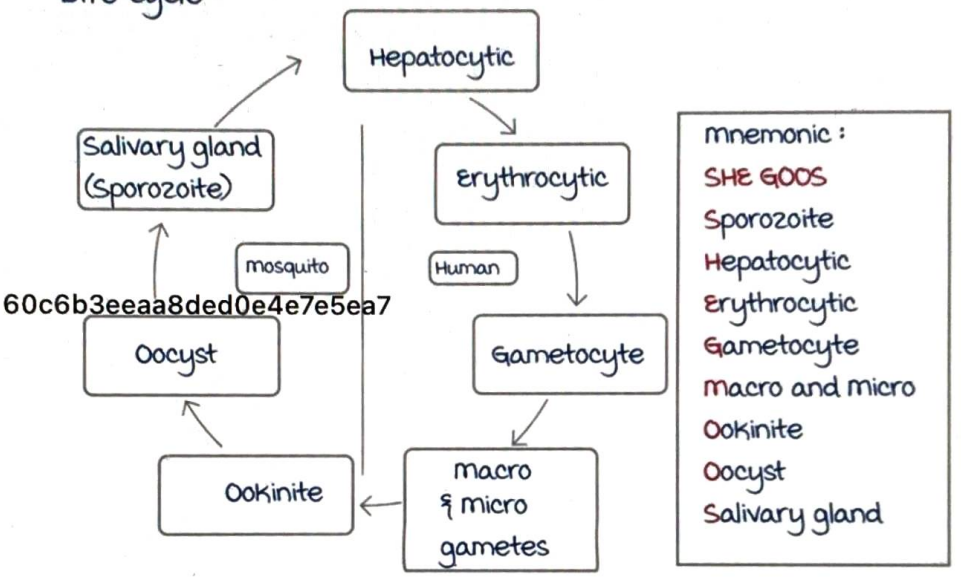
P. falciparum : MC in India.
more dangerous.

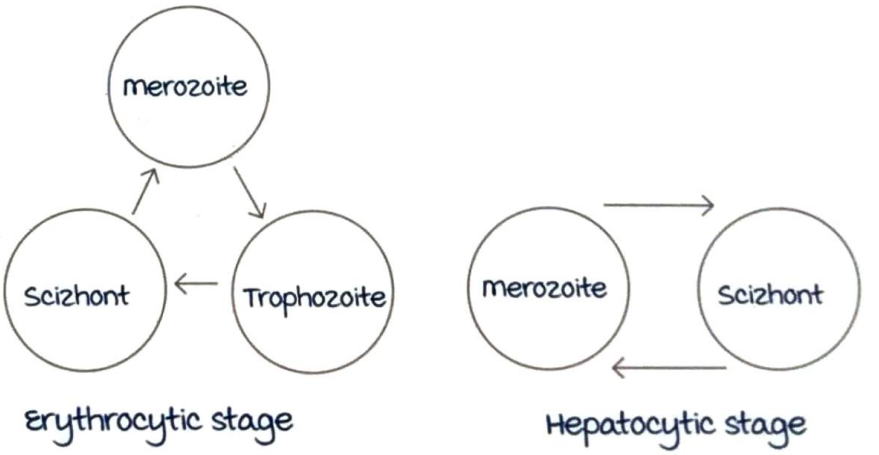
P. malariae.

P. ovale : Not found in India.

P. knowelsi : Predominantly seen in Indonesia, Vietnam, Myanmar, few cases from Andaman & Nicobar.

Life cycle :





MCQ points about malaria

00:07:08

1. Mosquito : Primary/definitive host (sexual development of plasmodium takes place here).
   Human : Secondary/intermediate host.

Active space

2. Hepatocytic stage : P. falciparum forms around 40,000 merozoites.
   Other plasmodium forms 10,000–20,000 merozoites.
3. Erythrocytic stage : Associated with clinical features (fevers, chills, rigor etc.,).
4. Plasmodium malariae : 72 hours of erythrocytic schigony (cycle time).
   Other Plasmodium : Around 36–48 hours of erythrocytic schigony.
5. Relapse : Coming back of infection.
   - P. vivax : Dormant hypnozoites cause relapse in 1–3 years.
   - P. ovale : 1–3 years.

   Recrudescence phenomenon : Due to sub optimal erythrocytic schizogony. Seen in :
   P. falciparum : 1–1.5 years.
   P. malariae.
6. Gametocytic stage :
   Both gametocytes should be present to infect a female Anopheles mosquito.
   > 12 gametocytes per mm^3 of blood is required for transmission of infection from human to mosquito.

Extrinsic incubation period :
Mosquito cycle : 10–12 days. Gametocytes entry to sporozoites exit.
Human cycle : 5–7 days. Minimum days for sporozoite to gametocyte.
Therefore, fogging is done once in 10 –12 days.

Epidemiological determinants : Agent factors 00:16:34

1. Minimum gametocyte infective dose : > 12 gametocytes per mm^3 of blood.
2. Humans remain infective for as long as both gametocytes present.
3. Main reservoir of malarial parasite : Humans, apes, monkeys, other primates.
4. Main source of infection : Infected mosquito or human.

5. Extrinsic incubation period : 10–12 days (gametocyte to sporozoite, chain of transmission is weakest here).

Host factors :

1. Age < 6 months : Chances of P. falciparum infection is low (High fetal hemoglobin → Resistant to P. falciparum).
2. Sickle cell trait : Mild form of infection (resistant to P. falciparum).
3. Duffy negative RBCs : Resistant to P. vivax.
4. Immune status in hyperendemic areas (P. falciparum endemic in Northeast states) :
   Immune status higher → Risk of infection/severity less.
   In malaria endemic area → Repeated exposures.
   ↓
   Population may have decreased susceptibility to infection.

Environmental factors

00:22:00

Peak season : End of summer (July to November, extending till December).

Malaria month : June.

60c6b3eeaa8ded0e4e7e5ea7

World anti malaria day : 25th April.

Higher altitude (>2000 to 2500 meters) : Mosquitoes not available.

Optimum temperature : 16–30 degree celsius.

Relative humidity : 60–75 %.

Modes of transmission :

Transmission occurs mainly by the vector, Female anopheles (live on blood).

- Direct transmission : Direct contact with vector.
- Congenital malaria : Rare (mother to baby).
- Transfusion related malaria : Trophozoite mediated.
  Trophozoites in the blood (Incubation period : 5–7 days).
  Donated blood : Plasmodia may be available >2 weeks (even if blood is kept at −4°C).
  Case of malaria or a person from malaria endemic area should not donate blood for at least 3 years.

Incubation period 00:27:28

Mnemonic : FXOM

Falciparum : 12 days.

Vivax : 14 days.

Ovale : 16 days.

Malariae : 28 days.

Vectors :

- Transmitted by female anopheles mosquito.
- Anopheles stephensi : Urban areas.
  Anopheles culicifaciens : Rural areas.
  Anopheles fluviatilis : Forest areas, foot hills.
  Anopheles sundaicus : Coastal areas (Andaman and Nicobar islands).
  Anopheles dirus : Coastal areas (Andaman and Nicobar Islands).
- Most common type of Anopheles implicated in malaria : Anopheles stephensi & Anopheles culicifaciens.
- Urban area common due to water source from overhead tanks.
- Aggressive : Highly efficient mosquito, lesser density required. Anopheles fluviatilis is very aggressive.
- Low efficiency : Needs higher density (Anopheles culicifaciens).
- GIS (Geopgraphic Information System) : To track the level of mosquitoes in an area.

Clinical features 00:32:48

3 Stages :

1. Cold stage :
   - Chills and rigors.
   - Person feels cold.
   - Associated fever (100°-104°C).
   - Lasts for 1/2 to 1 hour.
   - Person is very weak with weak pulse.
   - Parasites are seen in blood.
2.

3. Hot stage :
    - Skin is very hot.
    - Long lasting (2 to 6 hours).
    - Uncomfortable.
    - Strong : Rapid and bounding, full pulse.
    - Fever (101°–104°C).
4. Sweating stage :
    - Most comfortable.
    - No fever.
    - Increased sweat.
    - Lasts for 2 to 5 hours.
    - Proper rest.

Complications of malaria :

- Anemia.
- Direct organ damage : Hepatomegaly/splenomegaly/renal failure/meningitis/encephalopathy.
  Malaria is fulminant in people with less immunity, pregnancy.
- Black water fever (P. falciparum).
- Febrile herpes : Herpetic lesions around the mouth (in immunodeficient/overstressed people).

NVBDCP DIAGNOSIS & TREATMENT

National vector borne disease control program (NVBDCP)

00:00:08

It is the 1st program of independent INDIA, 1953, launched as national malaria control program.

Diseases included :

- Malaria
- Dengue
- Lymphatic filariasis
- Chikungunya
- Japanese encephalitis.

mosquito borne

- Kala azar : Transmitted by sand fly.

Targets of the program :

1. API (Annual Parasite Incidence) : < 1/1000.
2. ABER (Annual Blood Examination Rate) : > 10%.
3. Eliminate Kala azar and lymphatic filariasis.
4. Control morbidity and mortality from dengue.

Strategies of NVBDCP : Malaria :

Early diagnosis and prompt treatment of malaria.

Diagnosis :

1. Blood smear examination : Gold standard

Thick smear	Thin smear
To identify parasite.	To identify species of the parasite.

Stains used : 1. JSB (Jaswant Singh Bhattacharya) stain.
2. Giemsa stain.

2. RDT (Rapid Diagnostic Kits/Test) : Mostly in north-eastern states.
3. Clinical diagnosis.

Active space

Treatment strategies of malaria

00:08:06

According to NMDP (National Malaria Drug Policy) : 2014.

Plasmodium vivax infection :

DOC : Chloroquine + Primaquine.

Dose of Chloroquine : 25 mg/kg body weight over 3 days.

- Day 1 → 10 mg/kg
- Day 2 → 10 mg/kg
- Day 3 → 5 mg/kg

Dose of Primaquine : 0.25 mg/kg body weight for 14 days.

Plasmodium falciparum infection :

DOC : ACT (Artemisinin Combination Therapy)

Two types

60c6b3eeaa8ded0e4e7e5ea7

- ACT-SP (used in whole country) → Artesunate + Sulphadoxine + Pyrimethamine
- ACT-AL (used in north eastern state) → Lumefantrine + Artemether

Duration of therapy ACT-SP : 3 days

- Day 1 → Artesunate + Sulphadoxine + Pyrimethamine
- Day 2 → Artesunate + Primaquine (single dose)
- Day 3 → Artesunate

Active space

Dosage of ACT–SP

00:14:00

Age based categories :

Color	Artesunate (mg/day)	Sulphadoxine (mg/day)	Pyrimethamine (mg/day)	Primaquine (mg/day)
Pink (0 to 1 year)	25 mg	250	12.5	–
Yellow (1 to 4 years)	50 mg	500	25	7.5
Green (5 to 8 years)	100 mg	750	37.5	15
Red (9 to 14 years)	150 mg	1000	50	30
White (> 14 years)	200 mg	1500	75	45 mg

Contraindications of primaquine : Infants.
Pregnancy.
G6PD deficiency.

Contraindications of ACT–SP : 1. 1ST trimester pregnancy.
2. < 5 months of age.

Dosage of ACT – AL

00:20:38

Weight and age based categories :

Color	Age	Artemether (20mg)	Lumefantrine (120mg)
Yellow (5 to 14Kg)	< 5 months to 3 years	1 tablet	1 tablet
Green (15 to 24Kg)	3 to 8 years	2 tablets	2 tablets
Red (25 to 34 Kg)	9 to 14 years	3 tablets	3 tablets
White (>34 Kg)	> 14 years	4 tablets	4 tablets

BD for 3 days

Contraindications of ACT–AL : 1. 1ST trimester pregnancy.
2. < 5 Kg weight.
3. < 5 months of age.

Treatment of malaria in special cases 00:24:48

Malaria in pregnancy :

1st trimester : DOC : Quinine given at 10mg/kg body weight TDS for 7 days.
(Quinine may cause hypoglycemia, hence must be used cautiously).

2nd/3rd trimester : DOC : ACT-SP or ACT-AL.

Severe malaria :

Eg : Black water fever, cerebral malaria, malaria with danger signs.
Admit the patient and :

Initial : At least 48 hours	Follow up regime
Quinine : IV/IM 20 mg/kg (loading dose) ↓ 10 mg/kg (maintenance dose)	Quinine : 10 mg/kg TDS + Doxycycline or Clindamycin (in pregnancy, age < 8 years)
Artesunate : IV/IM 2.4 mg/kg given at 0, 12 hours, and daily 60c6b3eaa8ded0e4e7e5ea7	ACT-SP or ACT-AL for 3 days.
Artemether	ACT-SP or ACT-AL for 3 days.
Arteether : Contraindicated in < 5 to 6 years	ACT-SP or ACT-AL for 3 days.

Artesunate single therapy is banned in India and is only used in cases of severe malaria.

Treatment of malaria in special cases : Mixed infections 00:30:27

Mixed infections :
ACT-SP or ACT-AL + Primaquine at 0.25 mg/kg for 14 days.

General guidelines :
In case of vomiting after the intake of drug :
Repeat the dose with new blister pack.

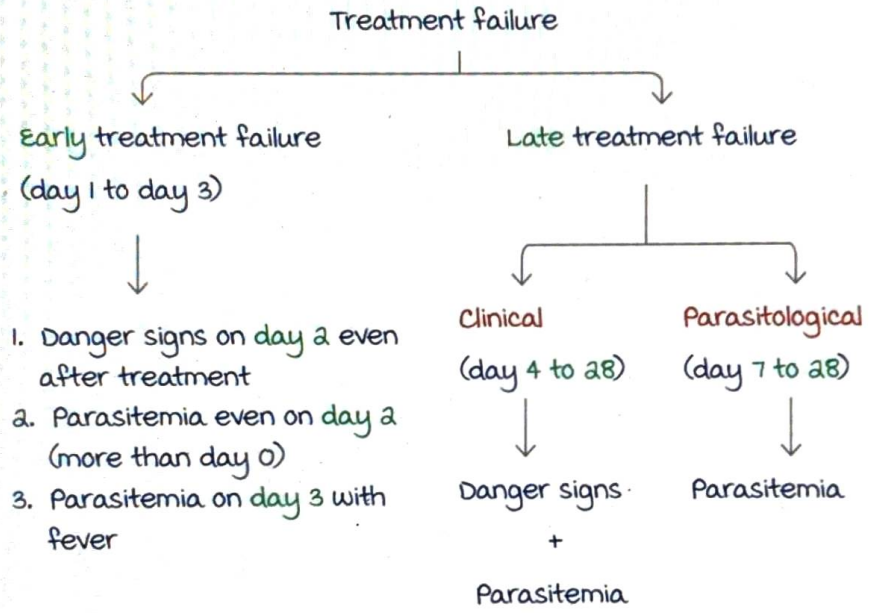
Active space

In North Eastern States (NES) :
Diagnostic test of choice : Blood smear.
RDT are also approved only in NES.
Malaria treatment : ACT – AL.
In all fever cases (in urban and rural areas) :
A smear examination (microscopy) should be done.

Since 2014, chloroquine presumptive treatment has been stopped.

Failure of malaria treatment

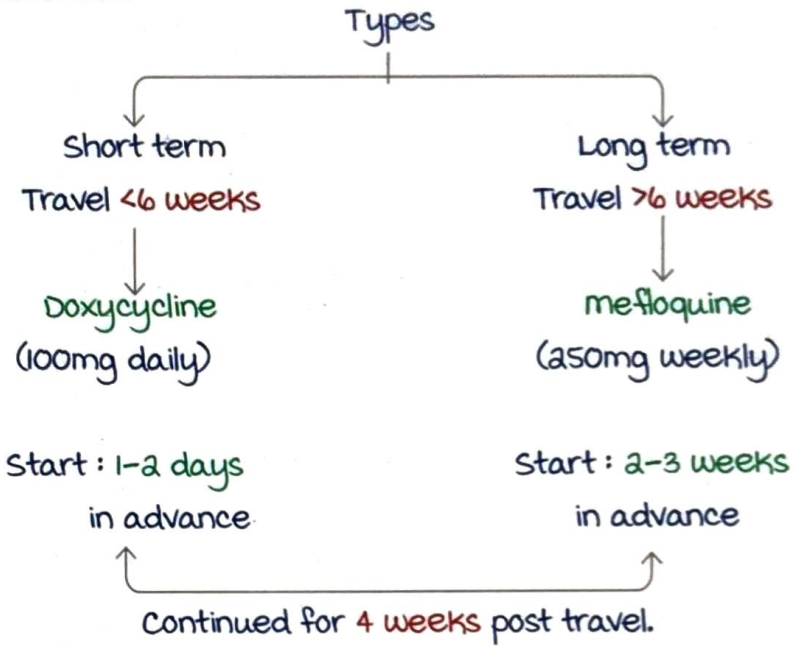
00:37:40



NVBDCP STRATEGIES

Chemoprophylaxis 00:00:37

1° Prevention.



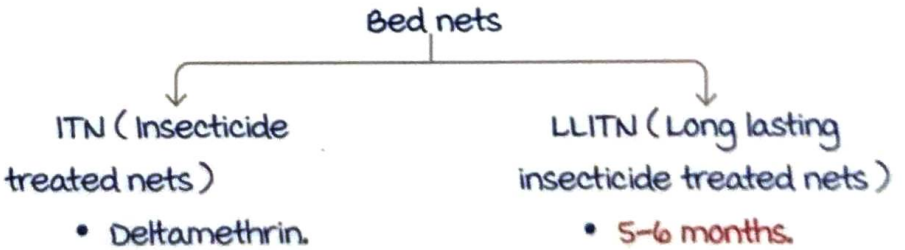
Integrated vector management 00:04:07

60c6b3eeaa8ded0e4e7e5ea7

All stages of mosquitoes are targeted.

Strategies :

1. Source reduction :
   - All diseases under NVBDCP are caused by mosquitoes except Kala azar (Sand fly).
   - Malaria : Clean stagnant water (roadside), overhead tanks etc.
   - Dengue : Check artificial water containers, coolers, empty tires, fountains etc.
   - JE/ Lymphatic filariasis : Check for large water bodies, blocked drainages etc.
2. Personal protection :



Active space

- 2-3 months.
- Given in areas where API > 2
  API : Annual parasite incidence
- Areas with API > 5.

Mosquito repellents : Chemicals

Natural	Chemical
Lemon grass oil.	DEET (Diethyl toluamide).
Citronella oil.	
Chrysanthemum oil.	
Neem oil.	

IVM : Anti-larval and Anti-adult methods 00:12:10

1. Anti-larval methods :
   a. Physical :
      - MLO (mosquito larvicidal oil) :
        Used at 200L / hectare.

   b. Chemical :
      - Paris green (stomach poison) : Not used.
      - Temephos (Abate) :
        Used at 200L / hectare.
      - Insect growth regulators (IGR) :
        Inhibit development of chitin.
        Inhibit moulding from pupa to adult stage.
        Mimic the mosquito hormones to inhibit adult maturation.
        Eg : Pyriproxyfen.
        Diflubenzuron.

   c. Biological :
      - Larvivorous fishes : Gambusia affinis.
        Poecilia reticulata.
      - Anti Larval bacilli :

      1. Bacillus thuringiensis (Bti H-14) :
         Anopheles stephensi.
         Aedes aegypti.
      2. Bacillus sphaericus :

Culex quinquefasciatus.
Used in polluted waters.

2. Anti-adult methods :

Space spray (Fogging)	Residual spray
• Malathion : 50ml/ litre diesel	• DDT 50% WP
• Cyphenothrin : 70ml/ litre	• Malathion 25% WP
• Pyrethrum extract: Indoor fogging	• Synthetic pyrethroids : Deltamethrin Cyfluthrin

DDT :

- Dichloro diphenyl trichloroethane.
- Discovered by Paul Miller in 1943.
- Due to the Stockhom convention, India cannot use more than 10,000 metric tons of DDT.
- Sprayed : 150 metric tons / million population (2 rounds) at the rate of 1 g/m^2.
- Residual effects : 12 - 15 weeks.

Malathion :

- Sprayed : 900 metric tons/million population (3 rounds) at the rate of 2 g/m^2.
- Residual effects : 6 - 8 weeks.

Other NVBDCP strategies

00:29:13

Active Case Detection (ACD) :

1953 : National malaria control program.

- First national health program.
- Surveillance done by malaria workers.
- House to house survey.
- Fever surveillance.
- Fortnightly surveillance system.
- Presumptive chloroquine treatment done.

Active space

1958 : National malaria eradication program.

Passive Case Detection (PCD) :

1971 : Urban malaria scheme.

- Drug delivery centres were set up.
- Fever treatment depots were set up.
- Setting up of malaria clinics.

1977 : Modified plan of operations

- States grouped into : API < 2
  API > 2

1998 : Roll back malaria

- WHO funding.
- New insecticides.

Tribal malaria action plan : Since most cases come from tribal area, more focus in these areas.

Organisation of NVBDCP 00:42:08

- Centrally run scheme.
- Hierarchy :

  Centre : National program officer (NPO)

  ↓

  State : State program officer (SPO)

  ↓

  District : District program officer (DPO / DHO)
- In the cities : Assistant malaria Officer (AMO).

Classification of states based on API :

Category :	API	Description
3	> 1	Intensified malaria control
2	< 1, some districts > 1	Pre-elimination
1	< 1, all districts < 1	Elimination
0	0	Prevention of Re-establishment/ Resurgence

For international malaria surveillance :

- API.
- ABER.
- Child spleen rate (No. of children with splenomegaly) :

Children of 2-10 years age.

Based on Child spleen rate, countries are divided into :

- < 10% : Non-endemic.
- 10-25% : Hypo endemic.
- 25-40% : Endemic.
- > 40% : Hyper endemic.

NVBDCP INDICATORS

NVBDCP indicators 00:00:13

API (Annual Parasite Incidence) :

- Its an impact/epidemiological indicator and a tool for action ; Target < 1/1000
- $\text{API} = \frac{\text{Total number of confirmed cases}}{\text{Total population under survey}} \times 1000$

Confirmed cases are either slide positive cases or RDK (Rapid D2 Kit) positive (in north eastern states only) :

Indicators post eradication :

ABER (Annual Blood Examination Rate) :

- Expressed as %
- It shows operational efficacy ; Target > 10%
- $\text{ABER} = \frac{\text{Total number of slides examined}}{\text{Population under survey}} \times 100$

SPR (Slide Positivity Rate) :

- It's an outbreak indicator.
- $\text{SPR} = \frac{\text{Total slides positive}}{\text{Total slides examined}} \times 100$

IPR (Infant Parasite Rate) :

- Sensitive indicator for recent malaria transmission in a community.
- $\text{IPR} = \frac{\text{Infants with parasitemia}}{\text{Total infants in the area}} \times 100$

CSR (Child Spleen Rate) :

- Used for global surveys.
- Indicates the trend of disease over a couple of years.
- For 2-10 years age.
- $\text{CSR} = \frac{\text{Total number of children with hypersplenism}}{\text{Total children in area}} \times 100$

Active space

Recent updates

00:11:05

1. Global technical strategy for elimination of malaria :
   - Launched in 2016 & applicable until 2030.
   - Objectives/targets :
     Decrease malaria mortality by 90%.
     Decrease malaria morbidity by 90%.
     more than 35 countries should achieve malaria elimination level.
     Prevention of re-establishment of malaria.

2. NFME (National Framework for Malaria Elimination) :
   - Started in the year 2016 & ends in the year 2030.
   - Targets :
     Malaria elimination by 2030.
     Prevention of re-establishment of malaria in the states who have achieved elimination level (API value is based on NFME).

3. Mosquirix vaccine :
   Recombinant, protein-based vaccine.
   Consists of a fusion protein (RT) which is attached to Hep B surface antigen.
   Contains RTS, S/ASO1.
   R : Repeat region of CSP.
   T: T-cell epitope of CSP.
   S : HbsAg.
   ASO1 : Adjuvant.
   CSP : Circumsporozoid protein of falciparum.

JAPANESE ENCEPHALITIS

Vector : Culex mosquito.

Virus : Group B arbovirus belonging to flaviviridae.

Zoonotic disease.

Man : Incidental host, dead end infection in humans.

Epidemiological determinants 00:02:07

JE is endemic in roughly 21 states of India.

(Bihar, Uttar Pradesh, Jharkhand, Assam, west Bengal, Haryana) → Bihar belt, (also endemic for falciparum malaria and Kala azar) → Karnataka, Tamil Nadu.

It is a seasonal disease (more in monsoons).

JE outbreak, occurs in 2 to 15 years.

Host factors :

Pig : Amplifying host.

Man : Incidental / dead end host.

Ardeid birds (Egrets) : Maintenance host.

Life cycle : Bird ⟷ Mosquito ⟷ Pig

↓

man

Vector : Culex mosquito (C. tritaeniorhynchus, C. Vishnui)

Mode of transmission : Mosquito bite.

more predominant in areas with rice/paddy fields.

Clinical features 00:07:10

1. Prodromal stage (1–7 days) : Fever with coryza.
2. Acute encephalitic stage (3–6 days) :
   - Raised intracranical tension.
   - Convulsions.
   - Sympathetic / Parasympathetic Involvement.
   - Focal neurological deficit.
   - Hemiplegia/quadriplegia.
   - Hearing /visual field defects.
3. Post encephalitic stage (sequelae) : Residual neurological deficit.

Mortality : 9-10 days from onset of disease.
Case fatality rate : 20 - 40%.
Investigation of choice : Igm ELISA (Capture).
Treatment : JE management Kit.
Symptomatic treatment : IV fluids.
Antipyretics (Paracetamol).
Diuretic → Mannitol.
Glycemic control.
Catheterisation.

Prevention

00:10:53

1. Vaccination.
2. Integrated vector management.

JE Vaccine :

Killed : Beijing and Nakayama strain.
Live : South African - 14 - 14- 2
(The only strain used in India).

Immunisation schedule :

According to National Immunization program (NIP) only in endemic states :

1st dose : 9 months
2nd dose : 16 to 24 months.
It should be given within 2 years according to NIP.
Diluent : Phosphate buffer since JE vaccine is in powdered form.
Gap between 2 doses → 3 months.

Incase of non-immunised children :

Can be given in children < 15 years of age in endemic districts.

Dose of JE vaccine :

0.5 mL sc in left upper arm.
Age < 3 yr → 0.5 mL, > 3yr→: 1 mL.

Emporiatrics 00:16:50

Study of diseases in travellers.
If stay in an endemic area is > 2 weeks.
JE live vaccine → For a healthy adult (> 15 years)
On 0, 7th, 28th day.
If the travel is frequent : Repeated every 3 years.

Integrated vector management :
Culex → Flight range : > 10 Km.
Anti-larval measures : Low effectivity.
Anti-adult measures : Spray or fogging
(Space spray, residual sprays).
Fenitrothion spray.
Malathion spray.
Ultra Low Volume (ULV) spray.

Spraying must be beyond the infective area since culex has high flight range.

DENGUE

60c6b3eeaa8ded0e4e7e5ea7

Dengue : Introduction 00:00:28

4 serotypes (1, 2, 3, 4).
No cross-immunity among the serotypes.
Dengue caused by Flavivirus.

WHO classification of SEAR (South East Asian Region) :

A : Hyperendemic : India, Bangladesh.
B : Uncertain endemicity : Bhutan , Nepal.
C : Non-endemic : Democratic people's republic (DPR) of Korea.

Vector :

Aedes mosquito : A. albopictus and Aedes aegypti.
Pure anthrophilic mosquito.
Nervous feeder : > 1 feed at a single time.
A. aegypti : Discordant feeder (> 1 feed to complete gonio tropic cycle).
A. albopictus : Concordant feeder (no extra feed required).
Once a mosquito is infected, remains infected for lifetime.
Transovarian transmission occur upon genital infection of the mosquito.

Environmental factor 00:05:50

Optimum temperature : 16–30 °c.
Humidity : 60–80%.
Dengue syndrome :

1. Uncategorised fever : No typical features of dengue syndrome.
2. Dengue fever : Arthralgia , myalgia , retro orbital pain.
   Fever has bimodal presentation, peaks on days 1 – 2 and resurges on days 5 – 6.
   Recovery within 7 – 10 days.
3. Dengue hemorrhagic fever :
   Dengue fever + hemorrhagic manifestation
   (Bleed from any natural orifice).

Clinical diagnosis : Tourniquet test > 10 petechiae /sq . inch.
(2.5 cm x 2.5 cm)

Lab diagnosis : 20% ↑ in hematocrit +/- thrombocytopenia
(Platelets < 1,00,000).

4. Dengue shock syndrome :

Pulse pressure < 20 mmHg.

Mean systolic BP (SBP) : < 90 mmHg for adults.
< 80 mmHg for children.

Diagnosis :

Investigation of choice :

within 1 to 5 days of fever : NS, Antigen test.

> 5 days of fever : Igm ELISA (MacCAPTURE).

Treatment

00:11:55

I.V fluid resuscitation.

Preferred fluid : Crystalloids > colloids.

Initial : 0.9% Normal saline (NS).

Maintenance : Ringer lactate (R.L) to prevent hyperchloremic acidosis.

Flow rate : 10-20 ml / kg → 6 ml/kg → 3ml/kg → 1.5 ml/kg

DHF grade I / II (vitals : normal)

↓

Hematocrit (Hct) /PCV >20%

↓

Crystalloids (0.9% NS) : 6ml/kg body weight x 1-2 hours.

↓

Check patient status

Improves → Step down technique.

No Improvement

Raised Hct → Step up technique (Increase the rate of crystalloid from 6ml/kg to 10ml/kg x 2-4 hrs)

Declining Hct → Suspect internal bleed. Arrange for blood transfusion.

Active space

Step down technique :

6ml / Kg body weight x 2-4 hrs
↓
3ml/Kg body weight x 2-4 hrs
↓
1.5ml/Kg body weight x 2-4 hrs

DHF : Grade III (vitals : abnormal)

Pulse pressure ≤ 20mmHg, Hct >20%
↓
Crystalloids (0.9% NS) 10-20ml/Kg x 1 hr.
↓
Check vitals
↓
Improves → Step down technique
No improvement → Hematocrit level
↓
Hct > 45% → Step up technique
Decreased Hct → Suspect internal bleed
↓
Start blood transfusion

Monitoring and evaluation

00:19:30

Larval surveillance :

1. Container index = $\frac{\text{No. of containers positive}}{\text{No. of containers checked}}$

2. House index = $\frac{\text{No. of houses positive for Aedes larva}}{\text{No. of houses checked}}$

3. Breteau index = $\frac{\text{No. of containers positive}}{\text{No. of houses checked.}}$

Active space

Breteau index is the most sensitive criteria to assess dengue endemicity.

Global strategy for prevention of dengue (2012-2020):

3 strategies:

To decrease dengue mortality by 50%.

To decrease dengue morbidity by 25%.

To control dengue in all areas.

LYMPHATIC FILARIASIS

Epidemiological factors

00:01:34

Lymphatic filariasis caused by :

1. Wuchereria bancrofti : Bancroftian filariasis.

2. Brugia malayi : Malayan/brugian filariasis.
3. Brugia timori.

In India, bancroftian filariasis (90%) and malayan filariasis is predominant.

Comes under the WHO neglected tropical diseases.

Target in India : Eliminate lymphatic filariasis by 2020.

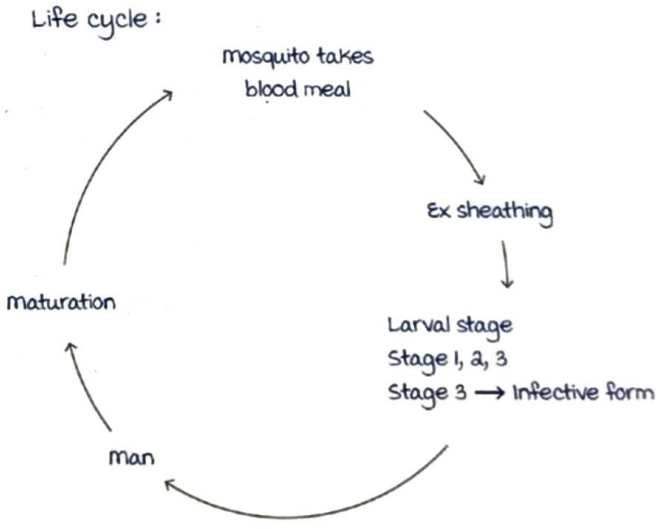
Agent factors :

Nocturnal periodicity.

Definitive host : Man.

Intermediate host : Mosquito.

Life cycle :



Cyclodevelopmental transmission : No multiplication of microorganism.

1 microfilaria/40 mm^3 of blood can infect 2.6% mosquito bites.

Host factors : Can affect any age, but maximally affects 20–40 years of age.

Active space

Environmental factors :

Temperatue : 20–30°C.

Humidity : 60–80%.

Vector : (a). Culex : Breeds in dirty, polluted water.

(b). Mansonia : Ponds, lakes with aquatic vegetation.

Culex fatigans :

Primary cause of bancroftian filariasis.

Also called C. quinquefasciatus.

Mansonia uniformis :

Primary cause of brugian filariasis.

Incubation period : Varies from 6–8 months to 15–18 months.

Clinical features

00:09:17

1. Asymptomatic amicrofilaremia :

Subtle infection.

Microfilaria not found in blood.

2. Asymptomatic microfilaremia :

Most common sources of infection.

3. Stage of acute infection : Fever, lymphangitis, swelling of lower limbs.

4. Stage of chronic disease :

Microfilaria can stay in the body 10–15 years after onset of acute stage.

Deterrent for early elimination for lymphatic filariasis.

Clinical presentations :

1. Occult filariasis :

Hyperresponsiveness of host to the infection.

No filaremia, but patient is symptomatic.

2. ADLA :

Acute Dermato Lymphangio Adenitis : Severe disease.

Require complete antibiotic course with antipyretics.

Recommended antibiotics : Oral amoxycillin, penicillin, erythromycin.

For severe ADLA : IV penicillin.

3. Lymphatic filariasis :

Stage of acute disease can present as :

1. Lymphedema affects :

a). Limbs

b). Genital area : Hydrocele.
Chylocele.
Swelling of scrotum/penis.

2. Renal damage : In 20–40% of patients.

Protein leakage : Characteristic of renal damage.

Hematuria may be present or absent.

Diagnosis of lymphatic filariasis 00:15:30

Investigation of choice :

Direct identification of parasite on thick peripheral blood film.

Microfilaria survey to be done between :

10 pm–2 am, due to nocturnal periodicity of the microfilaria.

Other methods :

1. Membrane filter concentration method :

Most sensitive method.

Requires specialized lab equipment and techniques.

2. DEC provocation test :

High specificity.

100 mg oral DEC given

↓

Check blood for microfilaria after 1 hour.

3. Clinical examination.

4. Serological tests :

Antigen/antibody testing.

Cannot differentiate between past and current infections.

5. Xenodiagnosis : Not used in India.

Prevention and treatment of filariasis 00:19:42

Involves chemotherapy and prophylactic therapy.

Drug of choice : Diethylcarbamazine (DEC) given at the rate of 6 mg/kg.

For treatment (chemotherapy) :

DEC : 6 mg/kg × 12 days (6 days + 6 days over 2 weeks)

+

Albendazole 400 mg (single dose) (for patients > 2 years)

Total dose of DEC : 72 mg/kg.

For prevention :

1. Mass drug administration : Done in a) Scabies.

b) Trachoma.

c) Lymphatic filariasis.

MDA is done annually.

Drugs given :

DEC : 6 mg/kg

+

Albendazole 400 mg (> 2 yrs)

200 mg (1–2 yrs of age)

In 2017, WHO recommended addition of ivermectin (150–200 mcg) to the annual MDA based on DOLF trial (death of onchocerciasis and lymphatic filariasis).

DEC + albendazole + ivermectin → Triple drug therapy.

2. DEC medicated salts :

Started in Maharashtra. High shelf life.

DEC added at the rate of 1–4 g/kg of common salt.

Vector control 00:25:35

Breeding sites :

Culex : In dirty polluted water.

Mansonia : In large water bodies.

Active space

Vector control measures :

1. Antilarval measures :

   Physical : Mosquito larvicidal oil.

   Pyrosene oil (pyrethroid extracts with oil)

   ↓

   Effective at the rate of 0.1 to 0.2% pyrethrin

   Chemical methods : Fenthion.

   Temephos.

2. Anti-adult measures : DDT, lindane, malathion.

   DDT → 6 monthly.

   malathion → 3-4 times/year.

3. Removal of aquatic plants : Pistia plants.

   Water hyacinths.

WHO lymphatic filariasis elimination strategy 00:28:51

60c6b3eeaa8ded0e4e7e5ea7

According to NVBDCP, coverage should be > 80 %.

1. Triple drug therapy.
2. Mass drug administration :

   If MDA is done in a community with > 65% coverage for atleast 5-6 rounds (yrs) then microfilaria will be < 1% in the community → Expected elimination level.

Status of lymphatic filariasis in india 00:31:53

2 areas of India involved : Bihar Belt → Bihar, UP, WB, Jharkhand.

Coastal areas.

After 5-6 rounds of MDA with > 65% coverage

↓

WHO conducts Transmission Assessment Survey (TAS)

↓

Microfilaria rate is calculated

↓

if < 1%

↓

Repeat 5-6 rounds of MDA and repeat TAS survey

Monitoring and evaluation indicators 00:34:56

Filarial control indicators :

1. Microfilaria rate : most sensitive indicator.

$$= \frac{\text{Persons with microfilaria / 20mm}^3 \text{ of blood}}{\text{Total population under survey}} \times 100$$

Indicates prevalence of infection.

2. Filarial endemicity rate :

$$= \frac{\text{No. of persons with microfilaria + clinical diagnosis diseases}}{\text{Total population under survey}} \times 100$$

Indicates prevalence of disease.

3. Microfilaria density :

Percentage of microfilaria per unit volume of blood.

Indicates intensity of infection/endemecity potential.

4. Average infestation rate :

Average microfilaria per positive slide or prevalence of microfilaria in the area.

KALA - AZAR

Epidemiological determinants

00:01:05

Protozoal disease.

Genus : Leishmania.

Endemic in the Bihar belt : Bihar, UP, WB, Jharkhand.

Agent factors :

1. Visceral leishmaniasis : Caused by L. Donovani.
2. Cutaneous leishmaniasis : L. Tropica.
3. Mucocutaneous leishmaniasis : L. Braziliensis.
4. Post Kala-Azar dermal leishmaniasis (PKDL) :
   Immune response after leishmaniasis.

Leishmania : Intracellular parasite.
In macrophages.
Divides within macrophages.
In vertebrates : Amastigote form.
Amastigote form within cell : Leishmanin / Donovan body.
In non-vertebrates : Promastigote form
↓
Usually flagellar

Reservoir :
Indian type Kala – Azar : Man is the only host.
Other types of leishmaniasis : Animal reservoir.
may be present.

Host factors :

1. Age : Can affect all ages (peak : 6-9 years).
2. Male : Female = 2 : 1.
3. ↓Socioeconomic status, ↓ literacy.
4. Malnutrition.

} Propentiating factors

Environmental factors :

Epidemic seasons → November
→ March / april
} Outbreak potential high

Kala Azar is generally seen more before & after rains.

Vector 00:07:59

Sandfly : Phlebotomus.

Types : P. argentipes : Vector for Kala – Azar.

P. papatasi
P. sergenti
→ Vectors for cutaneous leishmaniasis

Lives in cool / damp places.

Nocturnal.

Anthropophily : Love for human blood.

Mechanism of transmission 00:09:39

1. Bite of sandfly : Direct inoculation : most common.
2. Crushing of insect during feeds.
3. Blood products / blood transfusion : Rare.

Incubation period :

Varies from 10 days to 2 yrs.

1 – 4 months (average).

External IP (within the sandfly) : 1 – 4 weeks

Types of Leishmaniasis 00:11:28

a) Visceral leishmaniasis :

Also called Kala Azar.

Presents with classic triad of fever, weight loss, hepatosplenomegaly.

Anemia is also seen.

b) Cutaneous leishmaniasis :

Painful skin ulcers in exposed parts.

c) Mucocutaneous leishmaniasis :

Rapid destruction of mucosa of nose, mouth and pharynx.

d) Post Kala Azar Dermal Leishmaniasis (PKDL) :

Nodular infiltration on skin.

Nodules filled with microorganisms.

Definitions

00:13:54

1. Case : Fever > 2 weeks + Splenomegaly.
   With Rapid Diagnostic Test (RDT) or biopsy positive.
   a) Probable case : Features of Kala Azar with RDT positive.
   b) Confirmed case : Kala Azar + Parasitological confirmation.

2. Cure : Complete treatment taken and no signs / symptoms of disease.

3. Final cure : No symptoms or signs even after 6 months of treatment.

4. No response : Persistence of signs and symptoms even after 2 weeks of treatment.

5. Relapse : Resurgence of signs and symptoms within 6 months of treatment.

Diagnostic modalities

00:19:43

According to NVBDCP :

1. RDT : Rapid diagnostic test.
   RK 39 : Recombinant K 39 antigen.
   Qualitative assessment of antibodies for Kala Azar or L. Donovani.

2. Parasitological investigations : Gold standard.
   If positive : Confirmed case.
   Demonstration of LD bodies intracellularly.
   Biopsy from bone marrow, liver, skin, lymph nodes.

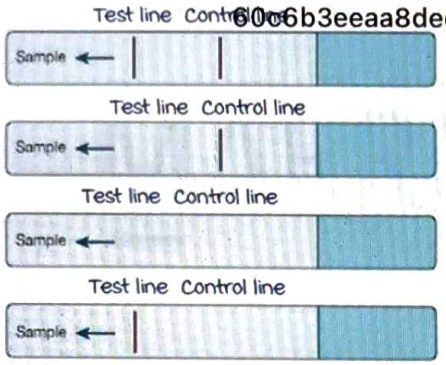
3. Aldehyde test of Napier : Good for surveillance.
   1-2 ml of serum → Add 40% formalin → Milky white precipitate.

Precipitate appears within 2-30 minutes : Test is positive.
Precipitate appears after 30 minutes : Test is not valid.

4. Serological tests :

- IFAT : Indirect Fluorescent Antibody Test.
- rK 39 : Currently used as field test.
- ELISA.
- DAT : Rapid direct agglutination test.

rK 39 :



- Positive :
  Both control and test lines appear.
- Negative :
  Only control line appears.
- Invalid :
  No lines appear below control and test line, or only test line appears.

5. Leishmanin test :

Also called montenegro test.

It is a skin reaction test.

0.1 ml intradermal injection of promastigote form of

L. Donovani

↓

> 5 mm induration

↓

Suggests test is positive

Monitoring and evaluation indicators 00:27:12

1. Detection rate :

$$= \frac{\text{Number. of new cases of Kala Azar}}{\text{Population under survey}} \times 100$$

2. Completion rate : (must be >90%)

$$= \frac{\text{Number of cases with } R_x \text{ completed}}{\text{Number of cases started on } R_x} \times 100$$

Active space

3. Coverage rate of vector control :

$$= \frac{\text{Houses protected}}{\text{Number of households at risk}} \times 100$$

4. Final cure rate :

$$= \frac{\text{Number of cases with final cure}}{\text{Number of cases started on } R_x} \times 100$$

5. Treatment failure rate :

$$= \frac{\text{Number of no response + Relapse + Death}}{\text{Number of treatment started cases}} \times 100$$

6. Loss to follow-up rate :

$$= \frac{\text{Number of defaulters + Number of loss to followup}}{\text{Number of cases started on } R_x} \times 100$$

Prevention and control of visceral leishmaniasis 00:30:40

Drug of choice : Liposomal Amphotericin B.
60c6b3eeaa8ded0e4e7e5ea7
10 mg/kg (single dose).

2. Miltefosine (oral capsules) :

Dose : Age > 12 yrs and weight > 25 kg : 50 mg BD.
Age > 12 yrs and weight < 25 kg : 50 mg OD.
Age < 12 yrs : 2.5 mg/kg.

Given for 28 days.

Liver and renal function tests done every month.

Other drugs : Amphotericin B.
Paramomycin.

Under NVBDCP :

1st line : Liposomal Amphotericin B (LAMB).
2nd line : Miltefosine +
Paramomycin (11-12 mg/kg) x 10 days.
3rd line : Amphotericin B.
4th line : Miltefosine.

Drug used depends on endemicity in the region.

Active space

Control of vector

00:35:40

- 1st line : DDT : 1 to 2 g/m^2 area.
- 2nd line : BHC (Benzene Hexachloride).

According to WHO, use of pyrethrins may be done in certain areas.

NATIONAL LEPROSY ERADICATION PROGRAM

Leprosy 00:00:17

Oldest disease known to mankind.

Also called as Hansen's disease.

Agent factors :

- Mycobacterium leprae (acid fast bacilli).
- Has predilection to affect Schwann cells and reticuloendothelial cells.
- Also known to occur in clumps known as Globi.

Source factors :

- Human is the only source in case of leprosy.
- Animal source is not known.

Infectivity :

- Highly infectious with low pathogenicity.
- 4–12% of close contacts will develop leprosy within 5 years.

Host factors :

- Occurs in middle age with peak around 20 – 40 years.
- Predominant in males.
- Large number of subclinical cases compared to clinical cases (since it is dependent on the cell mediated immunity).

Environmental factors :

- Spreads more in densely populated /overcrowded area.
- Increase in winter seasons.
- Leprae bacilli can live up to :

  9 days in dried nose secretions.

  45 days in soft soil at optimum temperature.

Incubation period : 5 – 7 years (some researchers pointing to > 12 years).

Mode of transmission :

Primarily droplet transmission through nasal secretions (portal of exit).

Contact transmission.

National Leprosy Eradication Program/NLEP 00:07:01

1948 : Hind Kusht Nivaran Sangh (societal organization).

1983 : National leprosy control program was started which subsequently became NLEP.

World Leprosy day celebrated on 30th January every year.

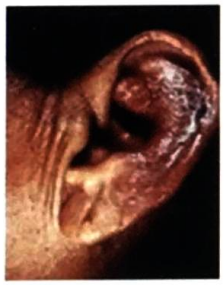
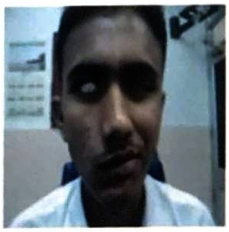
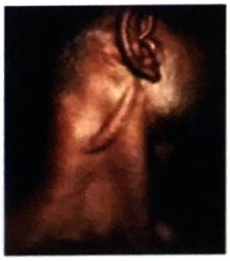
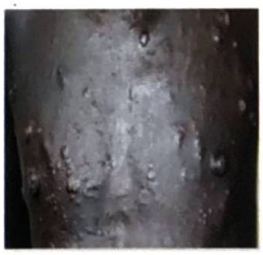
Theme for 30th Jan 2022 : Unite for Dignity.

Targets of leprosy program :

- Prevalence rate < 1/10000.
- Annual New Case Detection Rate (ANCDR) < 10 /lakh.

Strategy 1 :

- Early diagnosis and prompt treatment.
  Ridley-Jopling classification is not used for diagnosis/ treatement. Has only prognostic value.

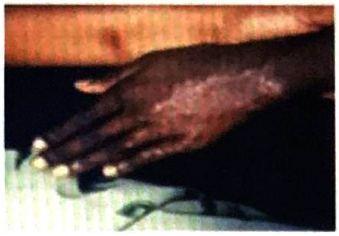
Diagnosis based on two modalities		
	Paucibacillary leprosy	multibacillary leprosy
Lesions	≤ 5	≥ 6
Nerve involvement	No or 1 nerve involved	2 or more nerves
Skin smear	No positive smear	Any skin smear positive
	  	

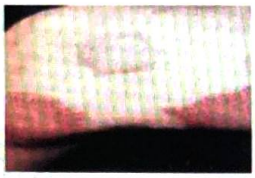
Active space

1. Skin lesion :

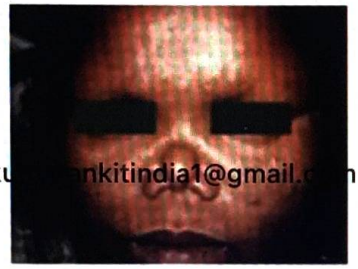
Hypopigmented (most common type).

Hypoanaesthetic (most specific type).

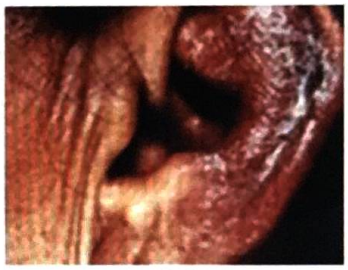





Special features of leprosy :

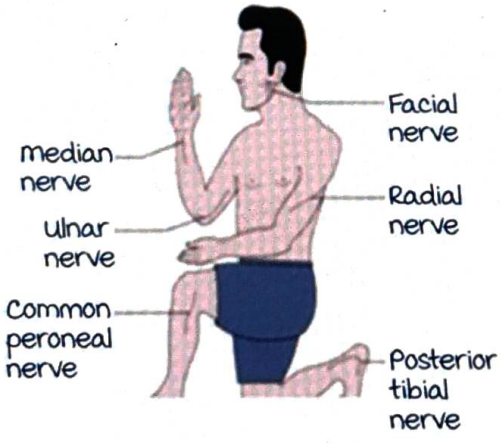


Saddle nose deformity



Shiny skin of face and ear lobes thickened

2. Nerve involvement



Most commonly involved nerve : Ulnar nerve.

Sensory deficit is more specific rather than motor deficit in leprosy.

Thickening of nerve is characteristic feature of leprosy.

3. Skin smear

Bacteriological index : Tells about the bacterial load.

Morphologic index :

Solid stained bacilli.

Used for resistance in leprosy.

Tells about live bacilli.

Active space

Logo of NLEP

00:16:44

Rays of Hope : multi drug therapy (MDT)
Lotus represents leprosy patient

Treatment : 2 treatment modalities, WHO & NLEP.

WHO Regimen	NLEP Regimen
PB : 3 drugs x 6 months MB : 3 drugs x 12 months	PB : 2 drugs x 6 months MB : 3 drugs x 12 months

NLEP regimen (followed in India) :

60c6b3eeaa8ded0e4e7e5ea7

Adult (> 14 years)

Type of leprosy	Drugs used (Adult)	Dosage	Frequency of administration	Criteria for RFT
MB Leprosy	Rifampicin	600 mg	Once monthly	Completion of 12 monthly pulses
	Dapsone	100 mg	Daily	
	Clofazimine	300 mg	Once monthly	
	Clofazimine	50 mg	Daily	
PB Leprosy	Rifampicin	600 mg	Once monthly	Completion of 6 monthly pulses
	Dapsone	100 mg	Daily	

monthly dose : supervised dose, RFT : Released From Treatment

Child (10 - 14 years)

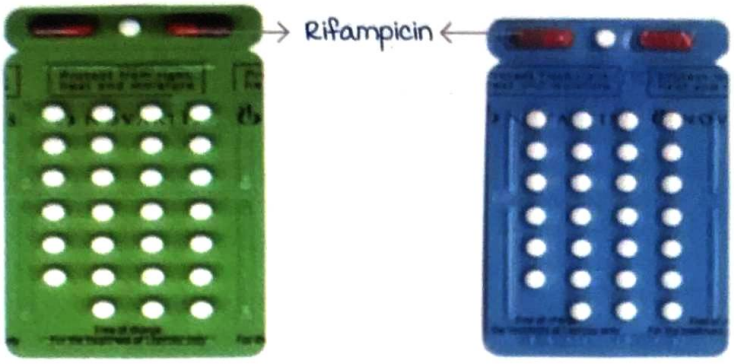
Type of leprosy	Drugs used	Dosage	Frequency of administration	Criteria for RFT
MB Leprosy	Rifampicin	450 mg	Once monthly	Completion of 12 monthly pulses
	Dapsone	50 mg	Daily	
	Clofazimine	150 mg	monthly	
	Clofazimine	50 mg	Alternate day	
PB Leprosy	Rifampicin	450 mg	Once monthly	Completion of 6 monthly pulses
	Dapsone	50 mg	Daily	

Active space

Colors of MDT

00:25:56

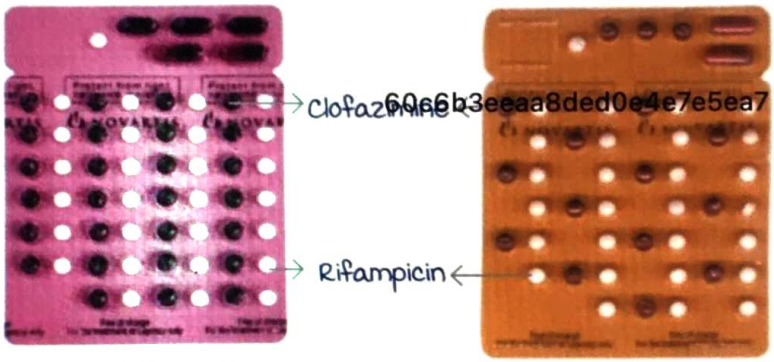
MDT for paucibacillary



Adult : green

Child : blue

MDT for multibacillary



Adult : red

Child : brown

Strategy 2 :

Tertiary level of prevention :

- Free reconstructive surgeries.
- Free prosthesis.
- Free MCR (microcellular) footwear.

Strategy 3 :

Primary level of prevention :

- Awareness of leprosy.
- UN mascot for leprosy : meena (cartoon girl child with a parrot).
- Mascot for India : Sapna (school going girl child).

Active space

SPARSH program : To create awarness about leprosy.
Uses mascot, Sapna or Meena

Strategy 4 :

Drug resistant leprosy : Duration of treatment is 24 months.

Resistance Type	Treatment	
	First 6 months	Next 18 months
Rifampicin resistance	Ofloxacin 400mg + Minocycline 100mg + Clofazimine 50mg	Ofloxacin 400mg or Minocycline 100mg + Clofazimine 50mg
	Ofloxacin 400mg + Clarithromycin 500mg + Clofazimine 50mg	Ofloxacin 400mg + Clofazimine 50mg
Rifampicin and Ofloxacin resistance	Clarithromycin 500mg + Minocycline 100mg + Clofazimine 50mg	Clarithromycin 500mg or Minocycline 100mg + Clofazimine 50mg

Strategy 5 :

Prophylaxis of Leprosy :

- Primary level of prevention.
- Prophylaxis given to close contacts (Single dose .Rifampicin).

Age/Weight	Rifampicin single dose
15 years and above	600 mg
10 – 14 years	450 mg
Children 6 – 9 years (weight ≥ 20 Kg)	300mg
Children <20 Kg (≥2 years)	10 – 15 mg/Kg

summary :

Primary prevention	Awareness of leprosy.
	Prophylaxis given to close contacts
Secondary prevention	Early diagnosis and prompt treatment

Active space

Tertiary prevention	Treatment of drug resistant leprosy
	Free reconstructive surgeries/disability limitation methods

WHO Regimen (2018)

Age group	Drug	Dosage and frequency	Duration	
			MB	PB
Adult	Rifampicin	600 mg once a month	12 months	6 months
	Clofazimine	300 mg once a months and 50 mg daily		
	Dapsone	100 mg daily		
Children (10 – 14 years)	Rifampicin	450 mg once a month	12 months	6 months
	Clofazimine	150 mg once a month, 50 mg alternate days		
	Dapsone	50 mg daily		
Children < 10 years old or <40 kg	Rifampicin	10 mg/kg once month	12 months	6 months
	Clofazimine	100 mg once a month and 50 mg twice weekly		
	Dapsone	2 mg/kg daily		

Organization of leprosy program :

District level : District level program officer.

Indicators of leprosy

00:38:24

Core indicators	Additional epidemiological indicators	Quality of service indicators
ANCDR (most important epidemiological indicator)	G2D among newly diagnosed	Relapse rate
G2D (Grade 2 disability) per 10 lakh population	Females among new cases	MDT complication rate

Active space

Cure rate	Child rate per lakh population	Blister stock rate
Prevalence rate (Impact rate)		

Grade 2 disability indicator :

- Most important operational indicator.
- Most important health awareness/leprosy awareness indicator.

Grades of disabilities

00:40:34

1. Grade 1 : No disabilities, thickening.
2. Grade 2 : Sensory loss, weakness (no visible deformity).
3. Grade 3 : Visible deformity.

Current prevalence rate : 0.67 (target : < 1/10,000)
Current ANCDR : 9.73 (target : < 10/lakh)
G2D among new cases : 5%

60c6b3eeaa8ded0e4e7e5ea7

Active space

NATIONAL POLIO SURVEILLANCE PROGRAM

Serotypes and polio vaccine

00:01:20

P_1	P_a
Most common. Epidemics. Stays longer in external environment. Water : 4 months Stool : 6-8 months	Easiest to Kill. First strain to go.

Oral polio vaccine (OPV)	Injectable polio vaccine (IPV)
Live vaccine Sabin In India : Bivalent (P_1, P_2) Useful in epidemics. Humoral and local immunity.	Inactivated Killed vaccine Salk P_1, P_2, P_3. Not useful in epidemics. Only humoral immunity.

OPV : P_a : maximum efficacy & maximum intestinal uptake.
IPV : Antibody production :
P_1 : 90%, P_a : 95% & P_3 : 70% (lowest).

VDPV and VAPP

00:05:22

Herd immunity : A group of people in a population are immunized and the rest get immunised automatically via feco oral route due to the shedding of the vaccine virus in stools.

Vaccine derived polio virus (VDPV) :
Since P2 strain has maximum intestinal uptake, mutations may occur.
Mutations can be of many types.
It can be stable, cause paralysis, can replicate and sustain in the environment.

Active space

These mutated strains cause VDPV.
Types : iVDPV, rVDPV, cVDPV.

cVDPV (Circulating VDPV) : Presently, sustains in low levels in the environment. Can increase, if there is low vaccine coverage/ low supplemental immunization coverage.

Vaccine associated paralytic polio (VAPP) :
Small, subtle mutations may happen that may precipitate with paralysis in certain sick people.

Recipient VAPP : Paralysis in a child who received OPV within 4 - 40 days of getting AFP (Acute flaccid paralysis).
Aberrant immune reaction, predominantly due to P_3 strain.

Contact VAPP : Unvaccinated non immune child, coming in contact of another child who is a vaccine recipient (excreted mutated virus) and develops AFP within 7-75 days of receiving OPV.
Contact VAPPs are in immunodeficient persons, mostly with P_2 strain.

VAPP : Cannot be transmitted from person to person.
Developed countries : Due to 1st doses of OPV specifically after IPV.
Developing countries : Due to subsequent doses of OPV.

End game strategy 00:27:11

The sequential pulling back of OPV and start of IPV is called end game strategy for polio.

P_1, P_2, P_3 (Trivalent OPV) $\longrightarrow$ P_1, P_3 + IPV (Bivalent OPV)

National switch day : 25 th April, 2016.
Last case of polio in India : Jan 2011 in West bengal.
India was declared polio free on 27th March, 2014.

National polio surveillance program

00:29:54

In charge is Surveillance medical officers (SMO) or District Immunisation officers (DIO).

A case of AFP reported to be put under investigation within 48 hrs.

Non probable polio cases :

- Traumatic AFP.
- Electrolyte disturbances.

Probable polio cases :

- Collection of stool samples.
- Within 10 weeks, should be reported as confirmed/ compatible/ VAPP/ polio discarded.

Confirmed case : Isolated polio virus in stool.

Compatible case : Death within 60 days of paralysis or only 1 stool sample available with residual paralysis on 60th day.

Under the DIO/SMO.

Start investigation within 48 hrs.

↓

Check for residual paralysis on Day 60.

Steps in stool examination :

Stool sample : 1st sample within 48 hrs.

and sample within 14 days of 1st sample. There should be atleast 24 hrs gap between the 2 samples.

Send samples to reference labs using reverse cold chain.

Reference labs :

- Apex reference labs in India.
- National institute of virology, Pune, Maharashtra.

International reference labs :

- WHO office in Geneva, Switzerland.

Diseases under International health regulations :

- Cholera.

Active space

- Yellow fever.
- Plaque.
- Polio.
- Influenza : SARS COVID.

Monitoring and evaluation indicators 00:38:33

1. AFP reporting rate :
   Should be >1 case/ lakh/ year.

Other causes of AFP : 60c6b3eeaa8ded0e4e7e5ea7

- Guillian-Barre syndrome.
- Transverse myelitis
- Traumatic neuritis
- Enterovirus 71,72

2. Stool adequacy rate :
   Should be >80%.
   Ideal stool quantity >8gm stool or thumb size stool.
   Ideal stool quality : Reverse cold chain should be maintained at 2-8°C.

3. Environmental surveillance :
   Testing sewage or water or other environmental samples for polio virus.
   There are 4 - 6 sites in country to test polio virus.

Polio vaccines :
Bivalent OPV (P1 + P2) + IPV.
bOPV is pink in color & has a vaccine vial monitor (VVM).
3 primary doses + 2 booster doses.
IPV is given in fractional doses (6, 14 weeks) 0.1 ml over right upper arm intradermally.

Note :
Africa, Nigeria have become polio free.
Pakistan and Afghanistan still have cases.

Active space

NIDDCP IDSP ICDS

National Iodine Deficiency Disorder Control Programme

00:00:22

1962 : Started as National Goitre Control Programme (NGCP).

1986 : Renamed as National Iodine Deficiency Disorder Control Programme (NIDDCP).

Target :

- <5% prevalence of Iodine Deficiency Disorder (IDD) in child (10 – 14 years).
- < 10% prevalence of Iodine Deficiency Disorder (IDD) in all age group.

60c6b3eeaa8ded0e4e7e5ea7

Strategy :

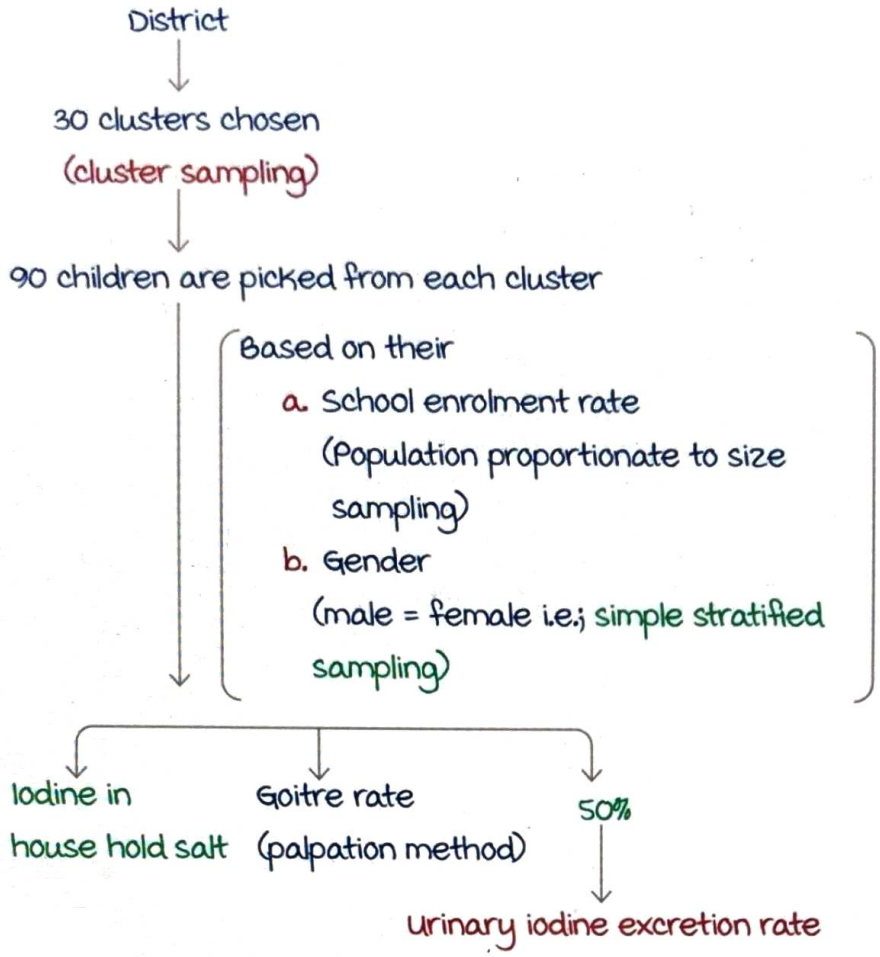
- Iodisation of salt.
- Type : Potassium iodate / iodide.
- Iodine concentration :
  At manufacture level : >30 ppm.
  At user/consumer level : >15 ppm.

Organisations :

At district level : DGC (District Goitre Control Cell)

Function : Conduct nwational IDD survey every year.

Active space



Monitoring and evaluation indicators - 60c6b3eeaa8ded0e4e7e5ea7

Goitre rate	Chronic / long term impact indicator
Urinary iodine excretion rate	most important indicator. Epidemiological indicator. Impact indicator.
Iodine in household salt (MBI Kit)	Process indicator & operational indicator.
Neonatal hypothyroidism rate	Sensitive indicator for assessment of the NIDDCP at community level.
Cretinism rate	

Urinary iodine excretion rate :

- >100 mcg/L : Normal.
- 50 – 100 mcg/L : Mild public health problem.
- 20 – 50 mcg/L : Moderate public health problem.
- <20 mcg/L : Severe public health problem.

Active space

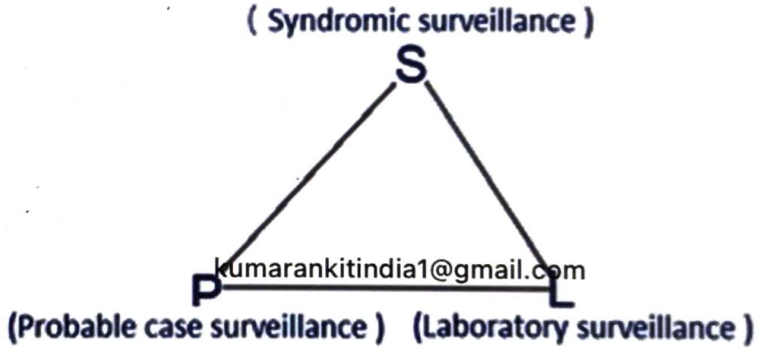
Goitre rate :

- >5% : Public health problem.
- 5 – 19% : Minor public health problem.
- 20 – 30% : Moderate public health problem.
- >30% : Severe public health problem.

Currently most parts of India have goitre rate of <5% and few have 5 – 19%.

Integrated Disease Surveillance Project 00:14:54

2004 : Started



Objectives :

A. Syndromic surveillance :
   By health worker.
   S form is used.
   Covers 6 syndromes :
   1. Fever with / without localised sign (measles, malaria, JE, dengue).
   2. Cough (TB).
   3. Acute Flaccid Paralysis : AFP (poliomyelitis).
   4. Jaundice (hepatitis, leptospirosis, malaria, yellow fever).

5. Diarrhoea (cholera).
6. Unusual disease / death (anthrax, plague).

B. Laboratory surveillance :

By laboratory technician, laboratory people.

L form is used.

Diseases covered :

Dengue/ DHF / DSS	Chikungunya
Japanese encephalitis (JE)	meningococcal meningitis
Typhoid fever	Diphtheria
Cholera	Shigella dysentery
Viral hepatitis A	Viral hepatitis E
Leptospirosis	Malaria
Plasmodium vivax (PV)	Plasmodium falciparum (PF)

C. Probable case surveillance :

P form is used.

By medical officer.

Diseases covered :

Acute diarrheal disease	Viral hepatitis
Enteric fever	Malaria
Dengue/Dengue hemorrhagic fever/	Acute Encephalitis syndrome
Dengue shock syndrome(DHF/DSS)	measles
Chikungunya	Pertussis
Meningitis	Fever of unknown origin (PUO)
Diphtheria	Pneumonia
Chicken pox	Acute flaccid paralysis <15 years
Acute respiratory infection (ARI)/Influ-	of age
enza like illness (ILI).	Snake bite
Dog bite.	Unusual syndrome not captured above (specify clinical diagnosis)
Any other state specific	
disease (specify)	
Leptospirosis	

Under surveillance all the data are collected every 14 days and published on monthly basis.

CBHI (Central Bureau of Health Investigation) :

- Next version of IDSP.

IHIP (Integrated Health Information Programme) :

- Digitalisation of health records.

Integrated Child Development Services (ICDS) 00:23:10

2 Oct 1975 : ICDS was launched.

Under Ministry of Child and Child Development.

A. Objectives :
   a. Holistic development of the child :
      Social component.
      Physical component.
      Nutritional component.
   b. Safe motherhood.

B. Beneficiaries :
   a. Children (0 – 6 years of age).
   b. Mother (pregnant and lactating).
   c. Adolescent girls (<19 years of age).

C. Benefits :
   a. Supplementary nutrition :

	Calories	Protein	INR
Child	500	12 – 15 gm	8/-
mother	600	15 – 20 gm	9.5/-
malnourished child	800	20 – 25 gm	12.5/-

   b. Non-formal education :
      Basic life style, manners, hygiene.
   c. Facilitating immunisation.
   d. Promote family planning services and basic health care.

Active space

e. Adolescent health :

Adolescent Girl health scheme (AG scheme).

Lately changed to Kishori Shakti Yojna.

Strategies :

1. G2G (girl to girl) approach (workshops).
2. Balika mandal (To empower Uneducated girls).
3. SABLA scheme :

State wise enabled programme.

For overall adolescent girl development.

Includes the following programs.

- NSDP (National Skill Development Programme).
- ARSH (Adolescent Reproductive Sexual Health)/ AFHC (Adolescent Friendly Health Clinic).
- PDS (Public Distribution System)/ WBNP (Wheat Based Nutrition Programme).
- AMB (Anemia Mukt Bharat) scheme.

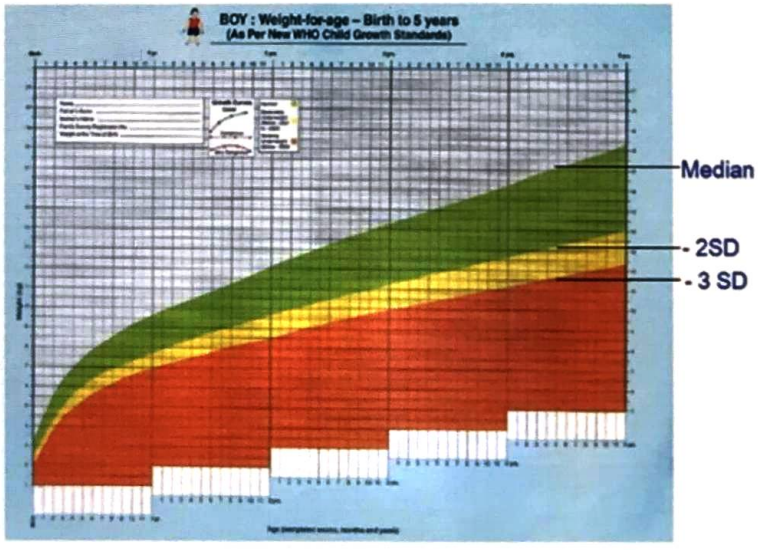
D. ICDS training : UDiSHA.

E. Growth monitoring :

. By ICDS growth chart.

Weighing by Salter scale.

Accuracy of Salter scale is 100 g.



The curve should be uprising.

Active space

Newer strategies 00:36:00

Sneha Shivir :

Special focus on malnourished child.

Anganwadi Karyakarti Bima Yojna :

Health insurance for anganwadi workers.

Organisation 00:37:24

CDPO (Child development project officer)

↓ Work at block level

(For 4 AW- supervisors and 100000 population)

Anganwadi supervisor

(For 25000 population)

↓

Anganwadi (AW) worker

(For 800 – 1000 population)

Mini anganwadi :

For mini area with lesser population (150 – 300).

EMPLOYEE STATE INSURANCE ACT, 1948 & FACTORIES ACT, 1948

ESI and Factories act comes under Ministry of Labor.

Factories act

00:00:39

- Established in 1948.
- To include all factories (where workers are employed).
- Factories included :
  If they use electricity/power > 10.
  If not using electricity/ power > 20.
- Space criteria : > 500 cubic feet per person.
- Timings :

i. < 48 hours per week or < 9 hours per day.
ii. < 60 hours per week including overtime.
iii. Adolescent children and pregnant and lactating females : 6 am – 7 pm only, No night duties.
iv. Adults : 9 hours with 1/2 hour break.
v. Adolescents : 4 and 1/2 hours per day.

Articles of Indian constitution :

1. Article 24 : Child act.
   No child of age < 14 years can be employed in any type of occupation.
2. Article 39.
   Children of tender age (15 – 19 years) should be given appropriate work as per their capacity and age (no hazardous work).
3. Article 21 : Right to Education.
   Free primary education for all children in India.

> 50 workers : Creche facilities (where mother and father can leave the baby & go to work).
> 250 workers : Canteen facility.
> 500 workers : Welfare officer.
> 1000 workers : Safety officer.

ESIC (Employee State Insurance Corporation) 00:06:22

- Started in 1948.
- 24.02.1952 : ESI corporation formed + Insurance scheme started.
- 24th february : ESI Day.
- Logo : Illuminating lives of thousands of people.

- 10% population (13 crore) insured by ESIC.
- Eligible organizations under ESI :
  All except defence, railways, mine industries, Central government employees.
- Mandatory ESI empanelment required by :
  All organizations with a worker load > 10 workers.

Eligible workers for ESI : Need not pay compensation.

i. Salary < 21,000 INR per month
ii. Wage < 176 INR per day.
iii. Physically handicapped employees : wage < 25,000 INR.

Contributions (Premium) :

1. Employee will pay 0.75% of their monthly wage to ESI.
2. Employer will pay 3.25% of employee's monthly wage to ESI.
   Total : 4%.

Benefits of ESI 00:12:35

1. Medical benefit : OPD, IPD, diet, treatment, investigation, medical devices.
   - Direct : Availed by the insured person (ESI employees).
   - Indirect : Panel system (Private hospitals empanelled with ESI).
     (Website : esic.nic.in).

2. Health benefits :
   - Sickness benefit : Sick employee will get some wage (91 days : up to 70% of wage).
3. Extended sickness benefit : Diseases with longer duration.
   - Applicable for 2 years.
   - Can avail up to 80% wage.
   - Only applicable for 34 diseases.
4. Enhanced sickness benefit :
   - Primarily for tubectomy/vasectomy.
   - 100% of wage up to 7 days (male)/ 14 days (female).
5. Disability benefits :
   - Includes temporary & permanent disability.
   - Decided by the medical board.
   - Not more than 90% of wage can be given.
6. Dependent benefits : Spouse or children < 18 years.
7. Maternity benefits : 100% wage.
   - 4 weeks (any medical condition affecting pregnancy).
   - 6 weeks of leave (abortions/miscarriage/loss of baby).
   - 26 weeks of leave (delivery).
8. Funeral expense :
   - Given to grieving family : 15000 INR.

In a private sector :

- Employer employing any disabled person : ESIC will take care of employer's contribution for 3 years.
- Disabled people → Wage relaxation < 25000 INR per month.

Schemes

00:22:07

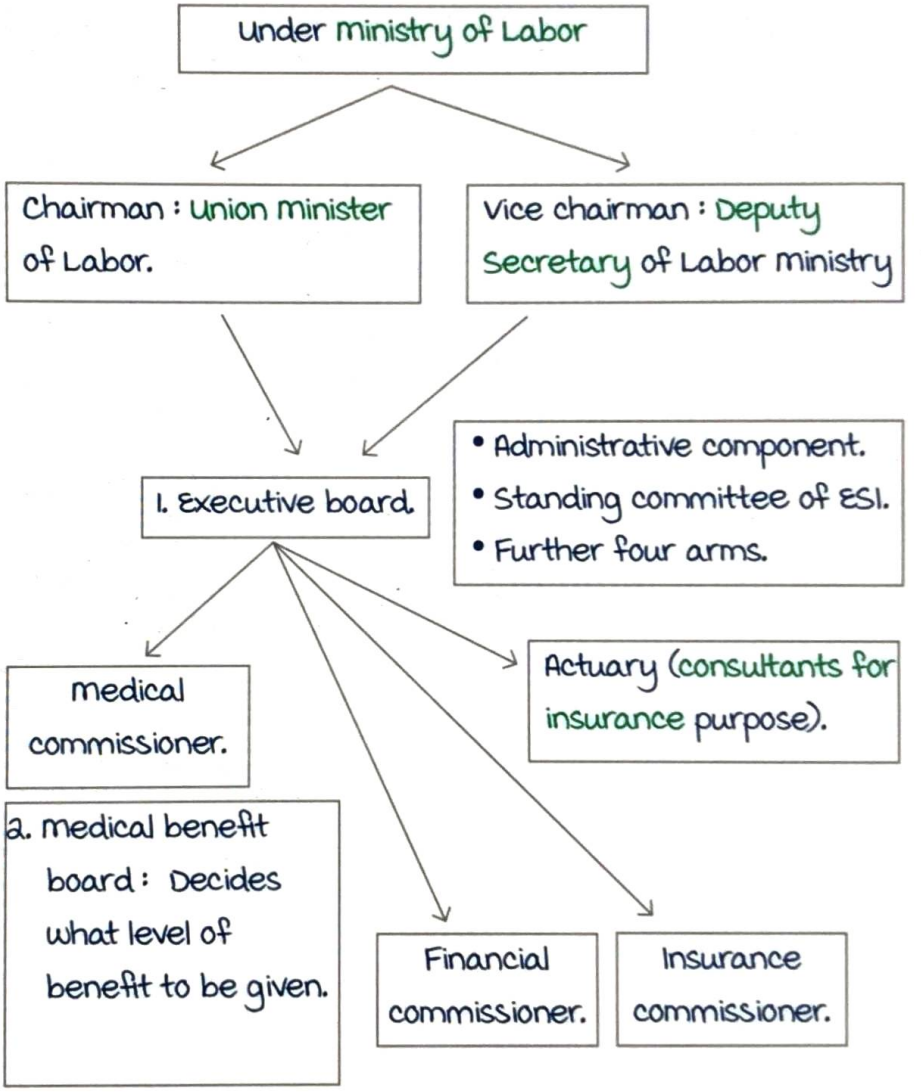
1. Shramnik Kalyan Yojna :
   - Unemployment protection scheme.
   - Employment in organization for 3 years → Unemployment (closure of company/ retrenchment/permanent invalidity : non occupational injury) → applicable to receive 50% of wage for 2 years, if they are eligible.

2. Atal Beemit Vyakti Kalyaan Yojna :

- Started in 2018.
- Extended till 2022.
- Unemployment protection scheme.
- Employed for at least 2 years, insured in ESI for more than 78 days in the previous insurable 3 months.
- Once in lifetime.
- Salary of up to 50% of wage for 90 days.

60c6b3eeaa8ded0e4e7e5ea7

ESI organization :



Services offered (Expenses) :

- 1/8th expenditure : State government.
- 7/8th expenditure : Central government.

Active space

NMHP AND NATIONAL HEALTH POLICY – 2017

National health policy (2017) :

Policy to be in effect for 5 years (i.e upto 2022).

Targets	Target year
Health status :	
A. Healthy life :	
• Increase in life expectancy at birth from 67.5 to 70 yrs.	2025
• Reduction in Total Fertility Rate (TFR < 2.1).	2025
• DALY (Disability Adjusted Life Year) regular tracking trend.	2022
B. Mortality :	
• Infant Mortality Rate (IMR) < 28 (IMR < 25 by 2025).	2019
• Reduce under 5-mortality to 23.	2025
• Maternal Mortality Rate (MMR) < 100 (MMR < 70 by 2025).	2020
• Neonatal Mortality Rate < 16, still birth < 10.	2025
C. Disease Prevalence	
• HIV: 90-90-90 (90 % deduction, 90 % treated, 90% viral load remission).	2020
• Leprosy elimination (current prevalence in India : 0.67/1000 population).	2018
• Kala-azar elimination : 2017. • Lymphatic filariasis elimination : 2017.	Extended to 2020
• Tuberculosis cure rate > 85%, case detection > 70%.	2025
• Blindness prevalence < 0.25 per 1000 population [NPCB target : Blindness prevalence < 0.3 by 2020] (NPCB : National Programme for Control of Blindness).	2025

• Decrease in premature mortality from cardiovascular disease, cancer, diabetes by 25%	2025
Health System Performance Indicators :	
• Increase utilization of health services by 50%	2025
• ANC coverage > 90%	2025
• Skilled attendance at birth > 90% (Currently, skilled birth attendance is ~ 74 %)	2025
• Fully immunized > 90%	2025
• Family planning > 90%	2025
Non communicable disease :	
• Hypertension and Diabetes-control status > 80%	2025
• Reduction in tobacco use < 30%	2025
• Stunting reduction < 40%	2025
• 100% safe water and sanitation	2020
• Reduce occupational injury by 50%	2020
Health system strengthening indicators :	
• Health expenditure to 2.5% of GDP	2025
• All IPHS standards to be implemented	2025
• Establish health surveillance	2020

National Mental Health Program

00:06:38

- Intelligence Quotient (IQ) = $\frac{\text{mental age}}{\text{Chronological age}} \times 100$
- IQ :

< 25	Idiot } Old classification of
25–49	Imbecile } mental retardation
50–69	Moron }
70–79	Borderline
80–89	Low normal IQ
90–109	Normal IQ
110–119	Super IQ
120–139	Very super IQ

Active space

> 140	Genius

Mental retardation :

IQ < 70 in a person is mental retardation.

- New classification : 50–70 : Mild.
  35–49 : Moderate.
  20–34 : Severe.
  < 20 : Profound.
- Measurement of Adult IQ : Wechsler's adult intelligence quotient scale.

Recent changes from DSM IV to DSM V

00:10:09

DSM : Diagnostic and Statistical Method.

- Autism spectrum Disease : Includes : Autism.
  Asperger's disease.
  Disintegrative disorders.
- Childhood bipolar disorder :
  Now called as disruptive mood dysregulation disorders.
- memory, learning disorder : Amnestic disease.
  Presently called as neuro-cognitive disorders.
- Mental retardation is replaced by intellectual disability.
- Somatoform disorder, somatization disorder, hypochondriasis, pain disorder.
  Presently called as somatic symptoms and related disorders.

Note :

Most common illicit drug used in India : Cannabis.

Most common substance used in India : Caffeine > Tobacco > Alcohol.

Most common mode of death in suicide : Hanging.

World No tobacco day : May 31st.

World mental health day : 10th October.

World suicide prevention day : 10th September.

Mental illness 00:14:30

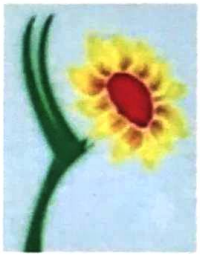
- Major mental illness :
  Classified as psychosis Includes : Schizophrenia, mania, endogenous depression.

- Minor mental illness :
  Neurosis → Includes personality disorders, OCD.

  - Maximum DALY : Depression.
  - Most common cause of death in mental disorder : Alzheimer's disease.
  - Mental morbidity in India : 18–20 per 1000 population.

National Mental Health Program 00:16:10

- Logo : Sunflower.
- Green ribbon : Symbol for mental health.



Objectives :

- mental health care (preventive and curative services) at district levels.
- Availability, applicability, accessibility of mental health care at all levels.

Strategies :

PTRP strategy : Under Bellary model.

Promote mental health.

Treat mental health disorders.

Rehabilitate.

Prevent mental health disorders.

RECENT ADVANCES IN COMMUNITY MEDICINE

Ayushman Bharat scheme

00:00:56

Two arms :

1. Pradhan mantri Jan Arogya Yojana :

- To provide health insurance.
- Largest health insurance : Provide insurance to eligible 10 crore families (approximately 50 crore population).
- Coverage : 5 Lakh/year/family.
- Eligibility : Any gender/age/ family member/disease.

Logo for Pradhan mantri Jan Arogya Yojana

2. Comprehensive primary health care :

- Holistic health care : Comprises of preventive care, curative care, rehabilitation and health promotion.
- Setup : Health and wellness centres (upgraded subcentres) with appointed CHO (Community Health Officer), who is a nurse.

Poshan Abhiyaan

00:05:05

POSHAN : Pradhan mantri Overarching Scheme for Holistic Nutrition.

To improve nutritional status of population.

Launched by Ministry of Health and Family Welfare & Ministry of woman and child development for 3 years.

Eligibility : 0 – 6 years of age.

Objectives :

- Decrease prevalence of LBW (currently 18 – 20%) and malnutrition in children > 5 years (currently 30 – 35%) by at least 2% per year.
- Decrease prevalence of anaemia in children by at least 3% per year.

LBW : Weight of the baby born is < 2.5 kg.

PM Poshan Shakthi Nirman scheme 00:07:38

Launched by Ministry of Education at Sep 2021.
Earlier known as mid day meal scheme.
Objective : Free elementary education along with mid day meal (which will help in nutrition and motivation to schooling and hence literacy).
Eligibility : Balvatika (pre school children) to 8th standard.

In this scheme, children in primary classes should be provided with 450 Kcal/meal/day and protein of 12 g/day, whereas in upper primary classes, they should be provided with 700 KCal/meal/day and protein of 20 g/day.

	For primary classes	For upper primary classes
Food grains (g)	100	150
Pulses (g)	20	30
Vegetable (g)	50	75
Oil and fat (g)	5	7.5
Calorie (Kcal/meal/day)	450	700
Protein (g)	12	20

Information technology innovations 00:12:38

- Nikshay (NIC : National Information center, Kshayrog : Tuberculosis/TB : Part of NTEP program.
  Software for reporting and logistics of TB data management and compliance.
- 99 DOTS, MERMS : Medicine Event Reminder Monitoring System.
  Part of NTEP program, to improve the compliance of drugs in TB treatment.
- ANMOL : ANM Online are devices like tablets which help ANM to reach out rural patient to the doctor online. It promotes telemedicine in rural areas.
- Swasthya Slate : Devices like tablets which help to

conduct multiple laboratory investigation (> 31 test) online in rural area.

- m – Cessation : Mobile application that can help cessation of smoking through behavioural therapy.
- Kilkari : Promote immunization.
- Nikusht : Software for reporting and data management of leprosy.

Nikshay : Tuberculosis.
Nikusht : Leprosy.
Nischay : UPT Kit in rural area, provided by ASHA.

MCH (Mother and Child Health) innovations 00:16:58

PMSMA, 2016 :
Pradhan Mantri Surakshit Matritva Abhiyan.
Launched by Ministry of Health and Family Welfare.
It comprises of antenatal care, free of cost universally to all pregnant women on 9th of every month.
Objective : Screening of high risk pregnancy.

PMMVY, 2017 :
Pradhan Mantri Matru Vandana Yojana.
Launched by Department of Women and Child Development (new ministry launched on 30th January 2006).
Cash incentive of Rs. 5000 as installment.

LaQshya, 2017 :
Labour room quality improvement initiative.

SUMAN, 2019 :
Surakshit Matratva Ashwasan.
Central government initiative with service guarantee.
Everything provided for free and good quality.
Objective : Zero preventable maternal and newborn death.

Active space

MDSR :

Maternal Death Surveillance Review 2021.

Documentation and analysis of maternal death and their causes.

Death reporting from lowest point of source : From delivery point or subcentres.

MCP cards/Mother and child protection card :

Components : Maternal records, newborn growth and development charts, immunisation charts, instructions to care mother and child.

VHSND (Village Health Sanitation & Nutrition Days) :

Held monthly.

Conducted by ASHA workers.

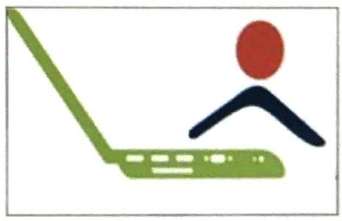
Health promotion activities

00:19:53

For better health care system.

- Pm Swasthya Suraksha Yojna/PMSSY - 2003 :
  To provide with 2°/3° health care for the whole country.
  Reason for more AIIMs like institutions all over country.
- National Digital Literacy Mission :
  To promote digitalisation of records.
  To promote use of internet and telemedicine or health care softwares.
- Accessible India campaign :
  Is to serve differently abled community of country.

Logo for accessbile India campaign



Logo for national digital literacy mission

Active space

Safe water sanitation and solid waste management :

- Swachh Bharat Abhiyan (Oct 2, 2014) :
  Help with solid waste management.
  To prevent garbage littering in the cities.

- Nirmal gram awards :
  To improve sanitation in community.
  Award/incentive given to village with no open air defecation and 100% toilet facility.

60c6b3eeaa8ded0e4e7e5ea7

- Kayakalp awards :
  Awarded to hospital administration if hospital is 100% sanitized.
  100% sanitization means good seating facility for patient bystander and care providers, clean and ample water supply, clean toilet, good lighting and good ventilation.

- Swajaldhara :
  Provide access to safe drinking water in villages to decrease the problem villages (no water supply within 1.6 Km).

Child care and development initiatives 00:25:42

- Nutritional rehabilitation centre (NRC) :
  Aim to decrease morbidity and mortality due to severe malnutrition.

- SAM/severe acute malnutrition criteria :
  Weight for Height below -3 SD.
  Mid upper arm circumference < 11.5.
  Presence of oedema.

- POCSO act : Started in year 2012.
  It is for the Prevention of Children to Sexual Offences and pornography.

Active space

4 important rights :

Right to safety.
Right to be heard and appeal for legal support.
Right to compensation.
Right of protection from sexual offences.

- Nirbhaya Nari Scheme :
  Launched by Ministry of women and child development.
  Fund raised from Nirbhaya Nari scheme is used for promoting Mission Shakti scheme and one stop centre scheme.

Mission Shakti, 2021 :

Initiative for women empowerment and gender discrimination started by Ministry of women and child development, Government of India.
It was launched in UP and has scaled upto many states in India.
Fund was from Nirbaya nari fund.
One stop centre scheme was included.

One Stop Centre Scheme :
The women need not go to different places, one centre is available for the following :

1. Medical assistance.
2. Police assistance.
3. Psychosocial support/ counselling.
4. Legal aid/ counselling.
5. Shelter.
6. Video conferencing facility.

Funded from Nirbhaya nari scheme.

Integrated Child Development Services (ICDS), 1975 :
Ministry of women and child department.
Covers children in rural areas.

Integrated Child Protection Scheme (ICPS), 2018 :
To protect urban slum children.

Mnemonic : WIGS approach.
Web based system.
Innovation : Helpline number.
more access to food & education.
Grants will be provided for Growth.
Shelter or protection from child labour, sexual abuse.

- UJALA (Unnat Jyoti by Affordable LED for All), Jan 2015 :
  To promote LED (Light Emitting Diode : 75 – 80% light energy 20 – 25 % heat).

- PM Ujjwala Yojna, 2016 :
  Safer fuels to all houses like LPG (subsidy) & to stop use of conventional firewood which may cause respiratory diseases (COPD).

- Ujjawala scheme, 2007 :
  Comprehensive scheme for prevention of human trafficking and rescue, rehabilitation and reintegration of victims of trafficking and commercial sexual exploitation. To decrease/ stop prostitution, exploitation of female workers.

Similar terms :
Ujala : Led lights.
PM Ujjwala Yojana : Safer fuels like LPG.
Ujjawala scheme : Prevention of human trafficking.

- AMRUT housing (Atal Mission for Rejuvenation and Urban Transformation) :
  Launched by Ministry of housing and urban affairs.
  Objective : House for all.

- AMRIT pharmacy (Affordable Medicine and Reliable Implants) :
  Launched by Ministry of health and family welfare.
  Setup : Amrit pharmacies, with low cost affordable medicines and implants.

Active space

Capping of price on implants and generic medicines.

- Rashtriya Arogya Nidhi :
  Health insurance for financial assistance.
  Eligibility : BPL families or life threatening diseases not covered under any scheme.

Consumer protection act (COPRA act), 1986 last amended in 2019 :

Recent amendments :

1. Right to be heard.
2. Right to choose treatment.
3. Right to safety.
4. Right to seek redressal.
5. Right to be informed.
6. Right to consent.

Who all are Included in COPRA : All organisations, all hospitals (govt/non govt/ESI), nursing homes, OPD clinics.

Mission Indradhanush (Rainbow) :

Immunisation of 7 vaccine preventive diseases covered initially.

Now intensified, for all 12 vaccine preventable diseases.

- Indradhanush scheme (by ESI hospital) :
  7 colours of bed sheets for a week : To promote better sanitation & hygiene.

- ESI (Employee State Insurance) :
  Government of India, under Ministry of labour.
  Newer update 2021 : Unorganised sector workers (farm/agricultural workers) also get benefits.
  Two types of medical benefits :
  Direct benefit by ESI.
  Indirect benefit by empanelled hospital.

Recent updates in 2020 – 2021

00:39:27

NFHS 5 report : National Family Health Survey report came in December 2021.
It includes : Pre school education, disability, access to toilet facility, bathing practise after menstruation, death registration, methods and reasons for abortion.

Most common causes of death 2019 report/MCCD 2019.

SRS (Scoliosis Research Society) 2021 report.

MMR (maternal mortality rate, 103 in India) special report 2022.

NTEP (National Tuberculosis Elimination Programme) :
Newer name for RNTCP.
Objective : To eliminate TB by 2025 from India.
Newer update : Bedaquiline containing regime.

NACO : National Aids Control Programme.
Integrated Dolutegravir into the NACO programme.

Rabies Control guidelines :
According to new guidelines, cooling period of 3 months only applicable in post exposure guidelines, not in pre exposure guidelines.

Nutrition : POSHAN (new scheme).

NLEP : National Leprosy Elimination Programme (2 drug regime for paucibacillary, 3 drug regime for multibacillary).

NPCBVI 2019 survey report :
To reduce prevalence of preventable blindness.
Level of blindness in India : 0.36, target < 0.3.
Most common cause in India : Cataract.

Active space

COVID - 19 vaccines.

MCH new programs.

Nutritional requirements : ICMR 2020.

Important dates :

Events	Date
World leprosy day	January 30
World cancer day	February 4
World hearing day	March 3
World water day	March 22
World meteorological day	March 23
World TB Day	March 24
Rabies awareness month	March
World health day	April 7
World malaria day	April 25
World immunization week	Last week of April
World day for safety at work	April 28
Safe motherhood day	April 11
Eye donation day	August 25 - September 8
World literacy day	September 8
World suicide prevention day	September 10
World Alzheimers day	September 21
World contraception day	September 26
World rabies day	September 28
World heart day	September 29
National nutrition week	September 1 -7

Events	Date
World labor day	May 1
World thalassemia day	May 11
World hypertension day	May 17
World no tobacco day	May 31
World environmental day	June 5
Antimalarial Month	June
National doctor's Day	July 1
Mid year population counting	July 1
World zoonoses day	July 6
World population day	July 11
World Hepatitis day	July 28
Breast feeding week	1st week of August
World mosquito day	August 20

Events	Date
World mental health day	October 10
World sight day	2nd Thursday of October
World disaster reduction day	2nd Wednesday October
United Nations day	October 24
World polio day	October 24
World diabetes day	November 14
World toilet day	November 19
Vasectomy fortnight	November last week & December first week
World AIDS day	December 1

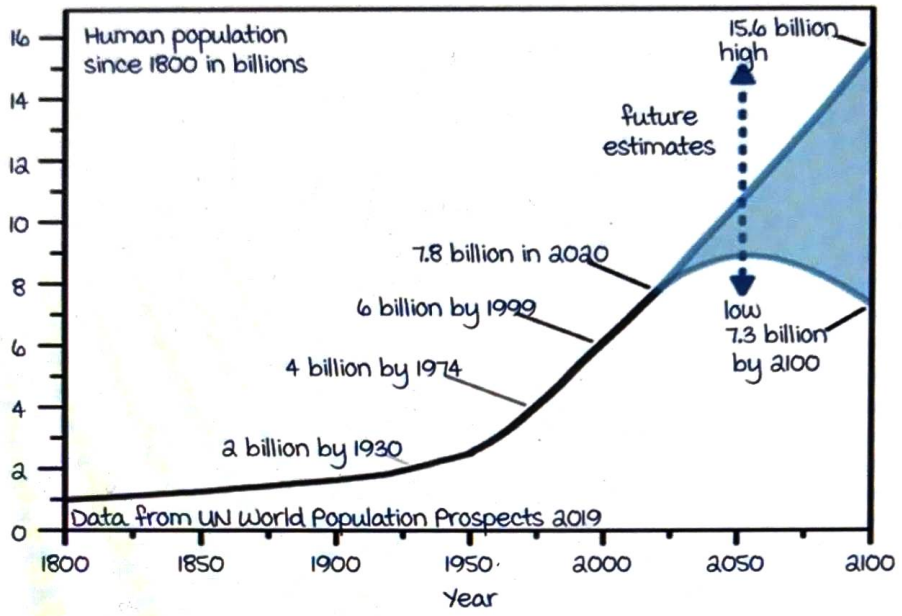
Active space

National (health) Program	Year of starting
National malaria control program	1953
National Vector Borne Disease Control Program (NVBDCP)	2003
National goiter control	1962
National Iodine deficiency Disorder control program (NIDDCP)	1992
Pulse polio immunization	1995
National switch day	April 25th 2016
Integrated Disease Surveillance Project (IDSP)	2004
Integrated Child Development Services (ICDS)	1975
mid day meal scheme	1995
TB control program	1962
National TB Elimination Program (NTEP)	2020
National AIDS Control program (NACO)	1992
National Leprosy control program	1995
National Leprosy Eradication Program (NLEP)	1983
National Family planning program	1952
Reproductive and Child health (RCH) - 1	1997
National Health Mission and RCH - 2	2005

DEMOGRAPHIC CYCLE

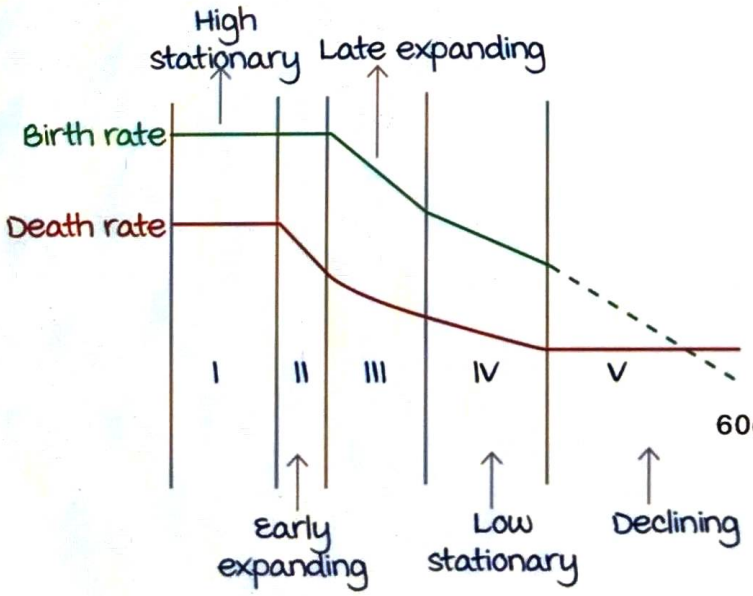
Introduction to demography 00:00:27

Demos means population and graphy means study.



In 2021, the global population was recorded as 7.9 billion.
Indian population : 138 crore and may reach 160 crores by 2060.

Demographic cycle 00:03:36



Death rate cannot be theoretically zero but birth rate can be theoretically zero.

Stages	Phase	Birth rate	Death rate
1	High stationary	High	High
2	Early expanding	High	Start declining
3	Late expanding	Start declining	Slow declining
4	Low stationary	Slow declining	Slow declining
5	Declining	Slow declining	Very low declining/ stable

In stage 5 : Birth rate may be less than death rate.

Demographic gap

00:12:16

It is the difference between birth rate & the death rate.
It starts increasing in stage 2 (due to decline in death rate).
It starts decreasing from stage 3(due to decline in birth rate).
Minimum in late part of stage 5.
Highest gap at the end of stage 2.

Stages	Demographic gap	Population	Examples
1	Stable	Stable	Rural Bangladesh, West Africa (Niger)
2	Start increasing	Explosive growth	Developing countries
3	Start decreasing	Increasing (but < stage 2)	Developing countries (India)
4 (Ideal)	Stable	Stable	Developed countries (US, Canada, UK)
5	Minimum, lowest, negative	Declining	Italy, Japan, Norway

DEMOGRAPHIC TRENDS

Demographic processes/ variables 00:00:20

Fertility/ Birth rates
mortality/ Death rates
marriage rates
migration rates (migration : Immigration & emigration)
Social migration (Mobility within socioeconomic classes).

Annual growth rate 00:02:36

$$\text{Annual growth rate (AGR)} = \frac{\text{Birth rate} - \text{Death rate}}{10}$$

Population	Annual growth rate
Slow growing population	<0.5%
moderate growing population	0.5 – 1%
Rapid growing population	1 – 1.5%
Very rapid growing population	1.5 – 2%
Explosive growing population	>2%

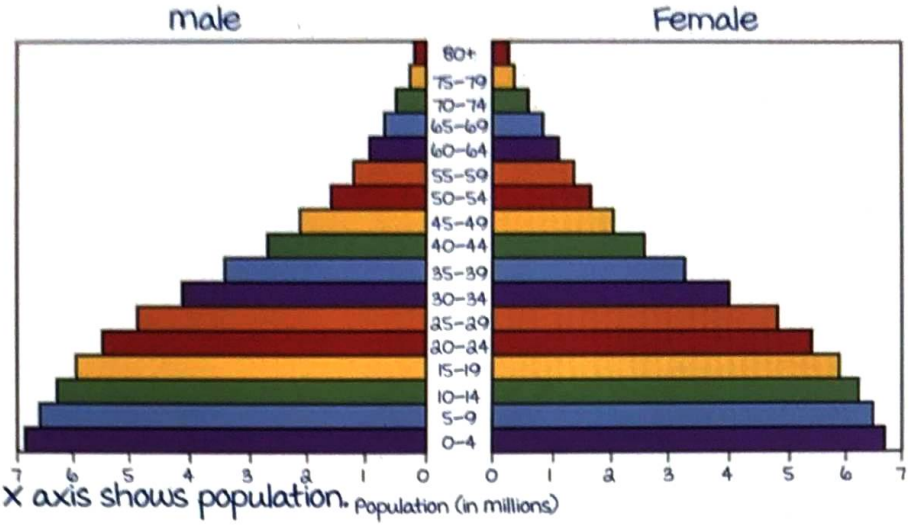
Malthusian growth model :

Annual growth rate	Population doubles in
1%	70 years
2%	35 years
0.5%	140 years
1.5%	47 years

India is currently in moderate to rapid growing state according to 2021 data showing AGR = 1%.

Age pyramids

00:07:28



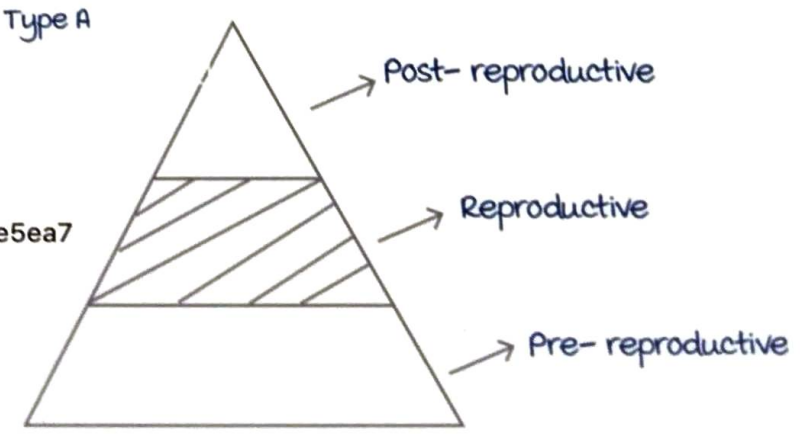
X axis shows population.

Y axis shows age.

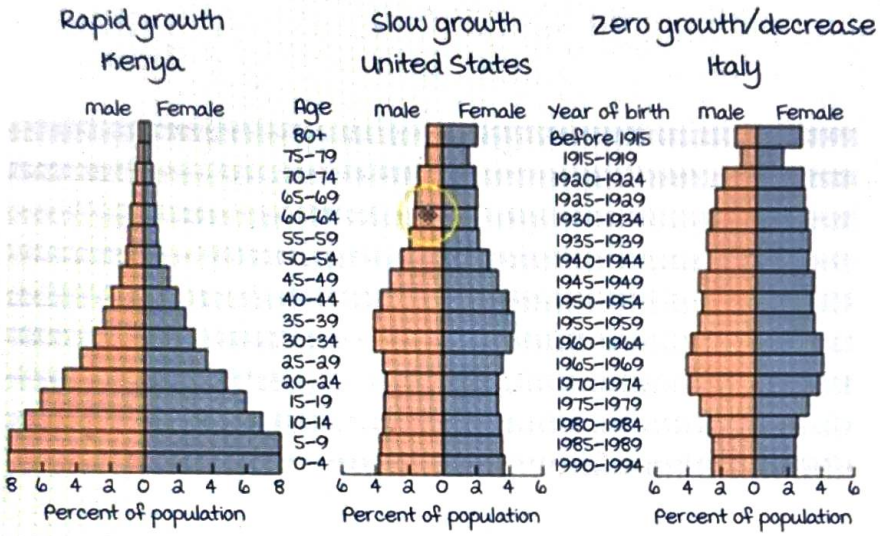
Height/ length of age pyramid signifies life expectancy in the area.

Classification of age pyramids :

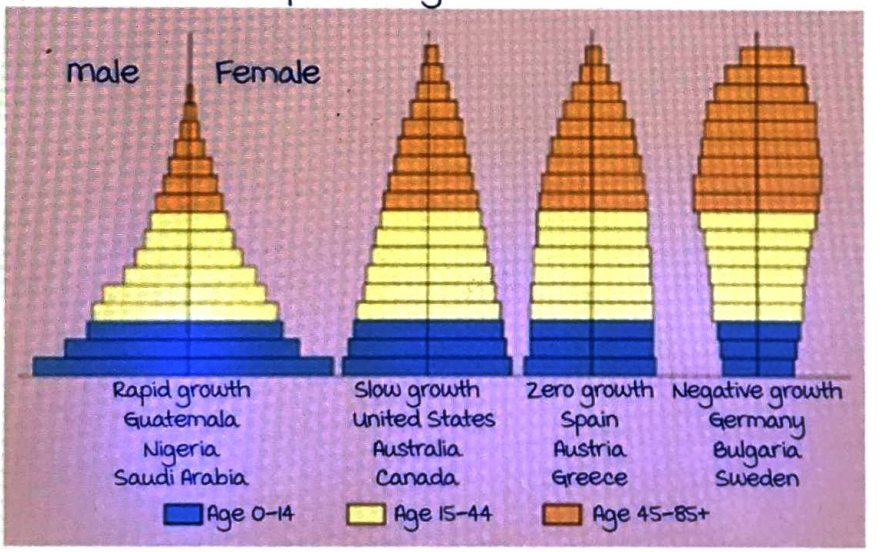
Type A	Type B
Developing country. Higher birth/ fertility rates. Broad base type of age pyramid. Younger population is more than the middle, middle more than the older population.	Developed country. Lower birth/ fertility rates. Broad belly type of age pyramid. Middle aged population is more than the younger and older population.



Triangular shaped (Type A)	Bell Shaped (Type B)	Urn shaped (Type C)
High birth rate.	Birth rate high with low death rates.	Birth rates might be equal or lesser to death rates.
Increasing/ growing population	Stable population.	Declining population



Population Age Structure



Demographic gift & liability 00:18:29

Demographic gift :

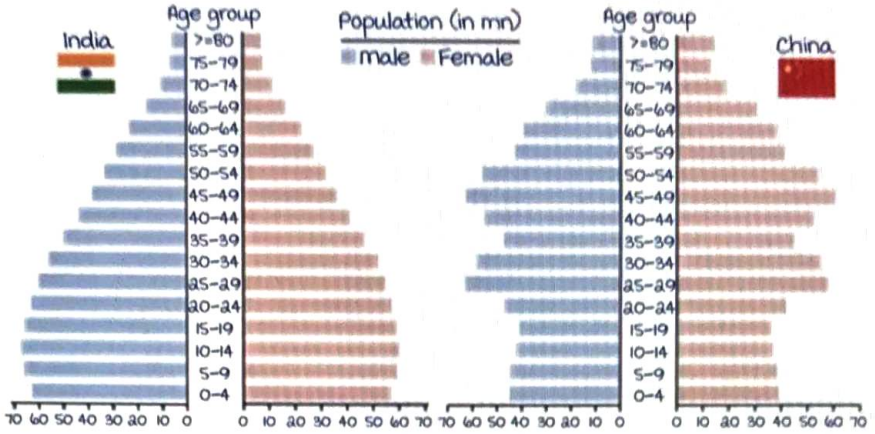
- Also called demographic bonus/demographic dividend.
- It is a term for higher number of economically productive population.
- Predominantly occurs due to a decline in birth rate.
- Maximally seen in stage 3.

Active space

- Lead to decrease in dependency ratio.

India's demographic edge over China,

India has 650mn people in the working age group of 25 – 65, while China has 830 mn. By 2040, India will have 170mn more working age people than China.



Demographic liability :

- more number of older populations in the country.
- Seen in stage 5.
- Occurs due to low birth rate and low death rates.

Dependency ratio

00:25:57

$$= \frac{\text{Total no. of dependent population}}{\text{Total no. of independent population}}$$

$$= \frac{\text{Age group} < 14\text{years and age} > 65\text{years}}{\text{Age group of } 15 - 64 \text{ years}} \times 100$$

In India,

Younger age dependency is 38.9%

Old age dependency is 9.7%.

Total dependency ratio being 48.6%.

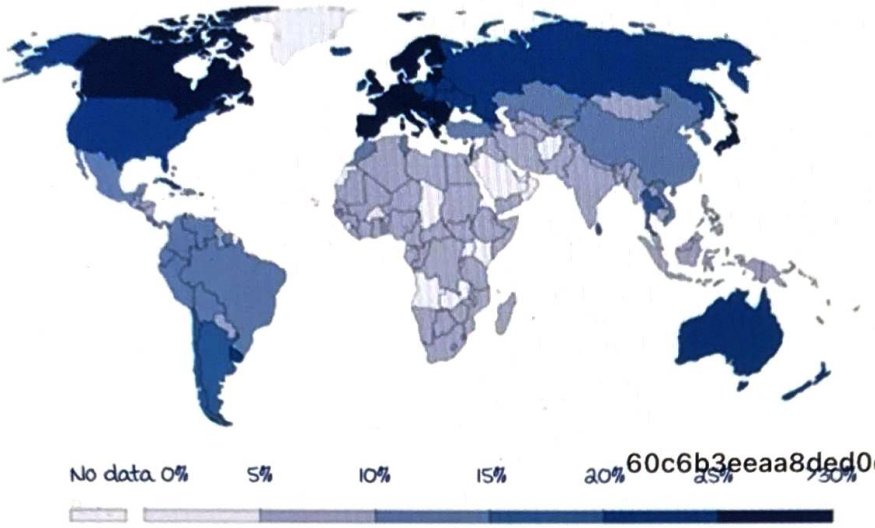
Major contributor to dependency ratio in India is the young age group.

Active space

Old age dependency ratio (2017):

This is the ratio of the number of people older than 64 relative to the number of people in the working age (15 – 64 years). Data are shown as the proportion of dependents per 100.

working - age population.



Active space

FERTILITY RATES

Fertility and reproduction indicators 00:00:20

- General fertility rate (GFR).
- Total fertility rate (TFR).
- Gross reproduction rate (GRR).
- Net reproduction rate (NRR).

Women of Reproductive Age (WRA) group : 15 – 49 years
(15 – 45 years).

General fertility rate (GFR) :

$$\frac{\text{Total number of live births in the area}}{\text{WRA}} \times 1000$$

Although two areas have same general fertility rate, population may or may not grow at the same rate.

Total fertility rate (TFR) :

$$\frac{\text{Total number of live births in the area}}{\text{WRA}} \text{ (with ASFR)}$$

Better indicator than general fertility rate.

Reproduction indicators 00:08:34

Gross reproduction rate (GRR) :

$$\frac{\text{Total number of daughters born in the area}}{\text{WRA}} \text{ (with ASFR)}$$

Better indicator than total fertility rate.

ASFR : Age specific fertility rate.

Active space

Net reproduction rate (NRR) :

$$\frac{\text{Total number of daughters born in the area (with ASFR \& ASDR)}}{\text{WRA}}$$

Better indicator than gross reproduction rate.
ASDR : Age specific death rate.

In fertility indicators, total number of live births is considered.
In reproduction indicators, total number of daughters born are considered.

Targets 00:13:41

Target of NRR is 1 (replacement level).
TFR should be <2.1 (0.1 is adjustment for gender bias).
Couple protection rate should be > 60%.
This helps in achieving the target of the National family planning program.
NRR is the most sensitive & one of the best indicator to evaluate National family planning program. It is also called as final impact indicator.
Couple protection rate is the functional indicator/operational indicator. It works at the lowest level.
TFR is the most important indicator : Epidemiological indicator.

Classification of states based on TFR 00:23:12

Classification of states based on TFR :

TFR	Status in India
< 2.1	24 states and UT
2.2 to less than 3.0	9 states and UT
≥ 3.0	3 states : UP, Bihar, Meghalaya

As per NHFS : 5 data, TFR of India is 2.0 and couple protection rate of India is around 66%.
TFR is the proxy indicator for complete family size as it indicates the total number of children for a couple.

Summary

00:26:00

	Total number of	A female will bear during her	Assuming/Adjusting for the
GFR	Children	Reproductive years	-----
TFR	Children	Reproductive years	Age specific fertility rate
GRR	Daughters	Reproductive years	Age specific fertility rate

NRR : Total number of daughters which a newborn girl child will bear during her entire life assuming the age specific fertility rates and age specific death rates.

Best indicator to evaluate the National Family Planning Program.

SURVEY TECHNIQUES

Survey techniques 00:00:53

1. CRS : Civil Registration System.
2. SRS : Sample Registration System.
3. NFHS : National Family Health Survey.
4. DLHS : District Level Household Survey.
5. Census.

Introduction : 60c6b3eeaa8ded0e4e7e5ea7

De facto Survey	De jure Survey
"As and where" basis. If you find a person in one place, you assume that they reside in that place. Old method (before 1930).	Used legal proof of permanent residency of an individual. Census uses this method 1930 onwards.

Civil Registration System (CRS) 00:02:36

Logo : Raising flame signifies birth ; flame going off signifies death.

Used for the birth and death registration in India.

Birth registered within 21 days.

Death registered within 21 days.

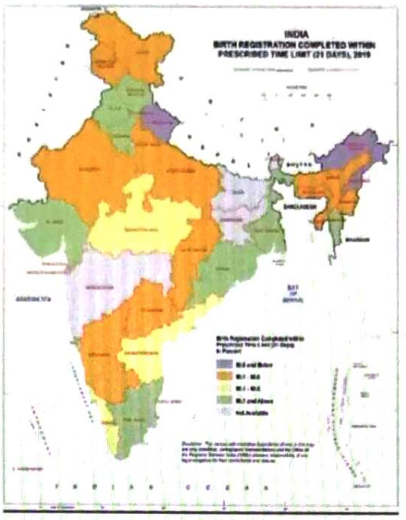
In case of non-resident Indians, birth & death should be registered within 90 days.

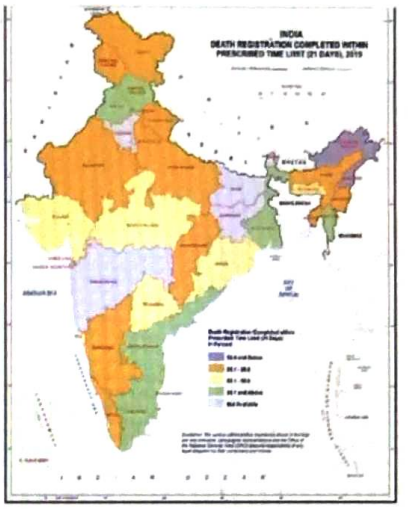
Births and deaths are considered as vital events. Hence, CRS is also known as Vital registration system.

Ongoing registration system under the Ministry of Home Affairs, Ministry of health & family welfare. Works under the Office of Registrar General of India.

It is not a survey technique.

Active space





Sample Registration System (SRS) 00:05:33

Conducted every 6 months at two levels.

National level data and state level data are triangulated (matched together) PHC → District → State → National.

Data is presented to the citizens.

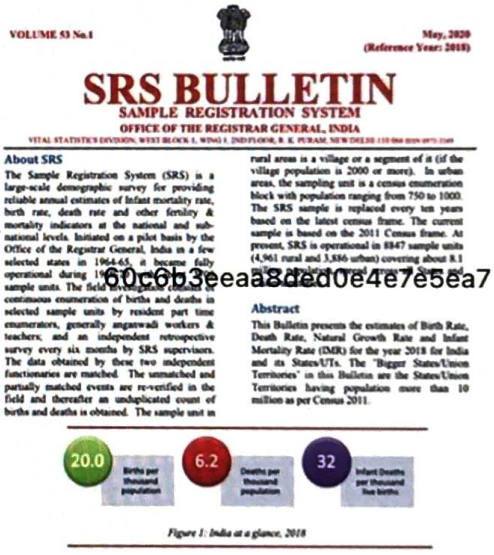
It is a dual registration system.

Also, a biannual system.

Indicators in SRS :

1. Crude birth rates (CBR).
2. Crude death rate (CDR).
3. Natural growth rate.
4. Infant mortality rate (IMR).
5. Maternal mortality ratio.

(All maternal and child healthcare indicators).


VOLUME 53 No.1 May, 2020 (Reference Year: 2018)

SRS BULLETIN

SAMPLE REGISTRATION SYSTEM

OFFICE OF THE REGISTRAR GENERAL, INDIA

VITAL STATISTICS DIVISION, WEST BLOCK 1, WING 1, 2ND FLOOR, R. K. PURAM, NEW DELHI-110 066

About SRS

The Sample Registration System (SRS) is a large-scale demographic survey for providing reliable annual estimates of Infant mortality rate, birth rate, death rate and other fertility & mortality indicators at the national and sub-national levels. Initiated on a pilot basis by the Office of the Registrar General, India in a few selected states in 1964-65, it became fully operational during 1969-70 with a network of sample units. The field [illegible] consists of continuous enumeration of births and deaths in selected sample units by resident part time enumerators, generally anganwadi workers & teachers; and an independent retrospective survey every six months by SRS supervisors. The data obtained by these two independent functionaries are matched. The unmatched and partially matched events are re-verified in the field and thereafter an unduplicated count of births and deaths is obtained. The sample unit in rural areas is a village or a segment of it (if the village population is 2000 or more). In urban areas, the sampling unit is a census enumeration block with population ranging from 750 to 1000. The SRS sample is replaced every ten years based on the latest census frame. The current sample is based on the 2011 Census frame. At present, SRS is operational in 8847 sample units (4,961 rural and 3,886 urban) covering about 8.1 million population. [illegible]

Abstract

This Bulletin presents the estimates of Birth Rate, Death Rate, Natural Growth Rate and Infant Mortality Rate (IMR) for the year 2018 for India and its States/UTs. The "Bigger States/Union Territories" in this Bulletin are the States/Union Territories having population more than 10 million as per Census 2011.

20.0 Births per thousand population

6.2 Deaths per thousand population

32 Infant Deaths per thousand live births

Figure 1: India at a glance, 2018

2021 data based on survey conducted in 2019 :

CBR : 19.7

CDR : 6.0

IMR : 30 per 1000 live births.

Active space

National family health survey - 5

00:08:24

NFHS-5 data released in 2021.

Conducted every 5 years at national level by Ministry of health and family welfare.

Work is done by International institute for Population Sciences (IIPS) in Mumbai.

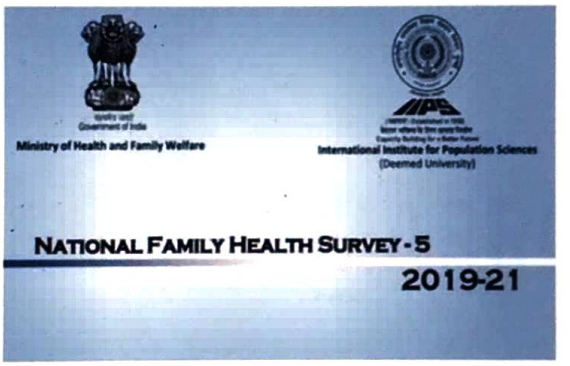
Conducted between 2019-2021 using de facto method.

Indicators in NFHS-5 :

1. Literacy rate.
2. sex ratio.
3. contraceptive use.
4. Hb levels (anemia prevalence).
5. Iron folic acid consumption.
6. Immunization rates etc.

Under NHFS-5 :

Blood pressure, blood glucose levels, waist and hip circumferences were considered for the first time.



New topics such as preschool education, disability, access to toilet facilities, death registration, bathing practices during menstruation and methods & reasons for abortion were also included.

HIV testing has been dropped (already NACO is working on it)

Four Questionnaires (four schedules) were used :

1. Biomarkers/laboratory measurements and anthropometric measurements.
2. Household.
3. Men.
4. Women.

Active space

Parameters :

Parameters	Percentage
Literacy rate (men, women)	84.4, 71.5
Sex ratio (total population, at birth)	1020, 929
TFR	2.0
Any method of contraception	66.7
Mothers with atleast 1 ANC in first trimester	70.0
Mothers consumed IFA tablets atleast for 100 days	44.1
Institutional births	88.6
Child age 12-23 months, fully vaccinated (vaccine card/recall)	76.4
Child with start of feed within one hour of birth	41.8
EBF fed child	63.7
Stunting in under five	35.5
Wasting in under five	19.3
Under weight for age	32.1
Overweight female (BMI > 25)	24.0
Overweight men (BMI > 25)	22.9

Sex Ratio : 1020, 929.

Number of females per 1000 males.

For the first time, India have more females per 1000 males.

Sex ratio at birth : 929 daughters per 1000 males.

Total Fertility rate : 2.0.

Literacy Rate :

1. Effective literacy rate : $\frac{\text{Number of people who can read and write in any language} \times 100}{\text{people age} > 7 \text{ years}}$
2. Adult literacy rate : $\frac{\text{Number of people who can read and write in any language} \times 100}{\text{people age} > 15 \text{ years}}$

Adult literacy rate is considered under NFHS-5.

Active space

Contraception :

Among the WRA (women in reproductive age) females (15-49) : 66.7%

Most common contraception : Tubectomy (38-40%).

Parameters	Percentage
Anemia in children 6 - 59 months	67.1
Anemia in females age 15-49 years	57.0
High blood sugar or on anti-diabetic medications (males, females)	15.6, 13.5
High BP or on anti-hypertensive medications (males, females)	24.0, 21.3
Women who use hygienic methods during menstrual period	77.3
Ever married females (18-49 years), ever experienced spousal violence	29.3
Any kind tobacco use in women age > 15 years	8.9
Any kind tobacco use in men age > 15 years	38.0
Any kind alcohol use in men age > 15 years	18.8
Total dependency ratio	48.7

Under 5 malnutrition rates range around 20-30%.

Anemia in females age 15-49 years : 57%.

Diabetes prevalence (male, female) : 15.6, 13.5.

Tobacco use in male : 38.0%.

Alcohol use in men : 18.8%.

Total dependency ratio 48.7%.

District Level Household Survey (DLHS) 00:19:55

It is an adhoc survey (not conducted at regular interval).

Conducted at district level.

Use : To know MCH parameters, growth parameters of children, for social variables which affect health (safe water supply, suicide rates, proper toilet facilities etc.)

Active space

Census

00:21:36

Conducted by the Prime minister's office under Ministry of Home Affairs every 10 years. Biggest survey in India.

Office of the Registrar General & Census Commissioner, India
Ministry of Home Affairs,
Government of India

To understand the demographic structure of the population.

Method : De jure method.

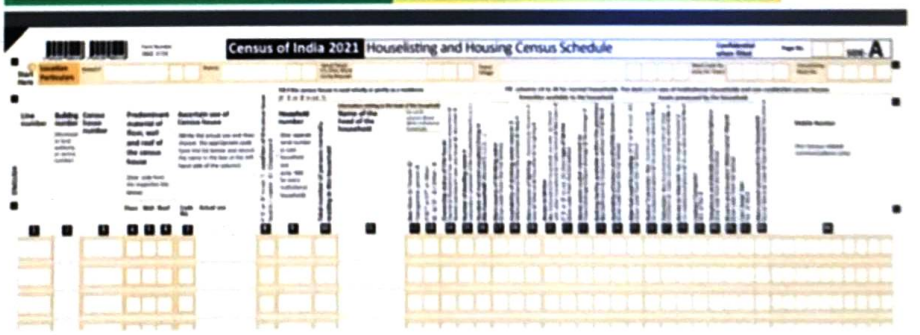
2021 Census (most data now available are of 2011 census)

2021 census is a digital census.

Differentiated the population based on :

1. Occupational categories.
2. Industrial worker classification.

Still in process, on the verge of completion.



One liners :

1. First official census was conducted in 1881.
2. In 1981, disability was accounted for in the census.
3. In 2021, industrial and occupational classification have been included.
4. 1921 is known as year of big divide, India showed rapid growth rate from this year onwards.

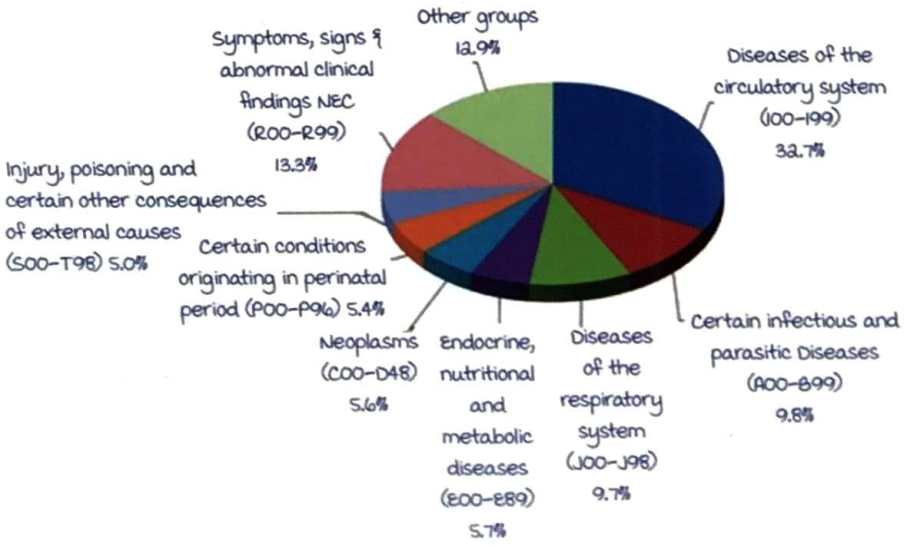
Active space

DEATH CERTIFICATES AND CAUSES OF DEATH : 2019 REPORT

Medical certification of cause of death (MCCD) 00:00:35

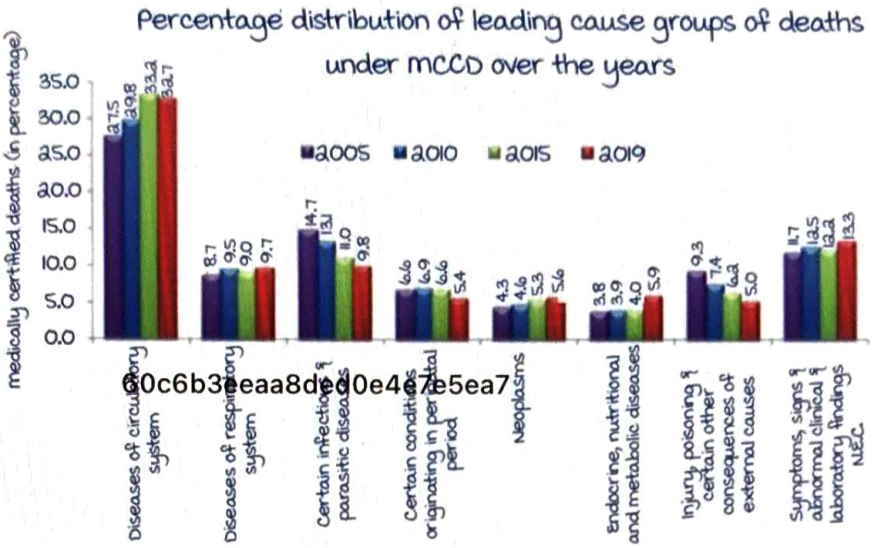
S. No.	Major cause group	Male		Female		Total	
		Number	%	Number	%	Number	%
1	Diseases of the circulatory system (I00–I99)	319431	33.7	193969	32.6	513390	33.7
2	Certain infectious and parasitic diseases (A00–B99)	96257	9.9	58319	9.8	154576	9.8
3	Diseases of the respiratory system (J00–J98)	96846	9.9	55465	9.3	152311	9.7
4	Endocrine, nutritional and metabolic diseases (E00–E89)	53682	5.4	36728	6.2	89410	5.7
5	Neoplasms (C00–D48)	50061	5.1	37254	6.3	87315	5.6
6	Certain conditions originating in the perinatal period (P00–P96)	50704	5.2	34330	5.8	85034	5.4
7	Injury, poisoning and certain other consequences of external causes (S00–T98)	54999	5.6	24136	4.1	79135	5.0
8	Symptoms, signs & abnormal clinical findings NEC (R00–R99)	126616	13.0	81711	13.7	208327	13.3
9	Other groups	129613	13.3	72439	12.2	202052	12.9
	Total	977199	100.0	594341	100.0	1571540	100.0

Percentage distribution of deaths under MCCD by leading cause groups – 2019



Active space

most common (leading) cause of death in India as per report on medical certification of cause of death in 2019 is diseases of the cardiovascular system.



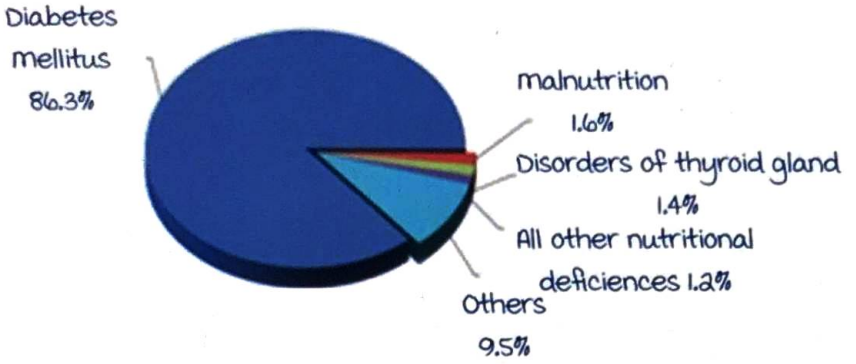
- There has been an increase in mortality due to diseases of circulatory system during the years 2005 to 2019.
- There has been a decline in mortality due to certain infectious and parasitic diseases during the years 2005 to 2019.
- Mortality due to endocrine, nutritional and metabolic disturbances increased in the year 2019, despite being constant during the past decades.

As per report on Medical certification of cause of death, 2019 :

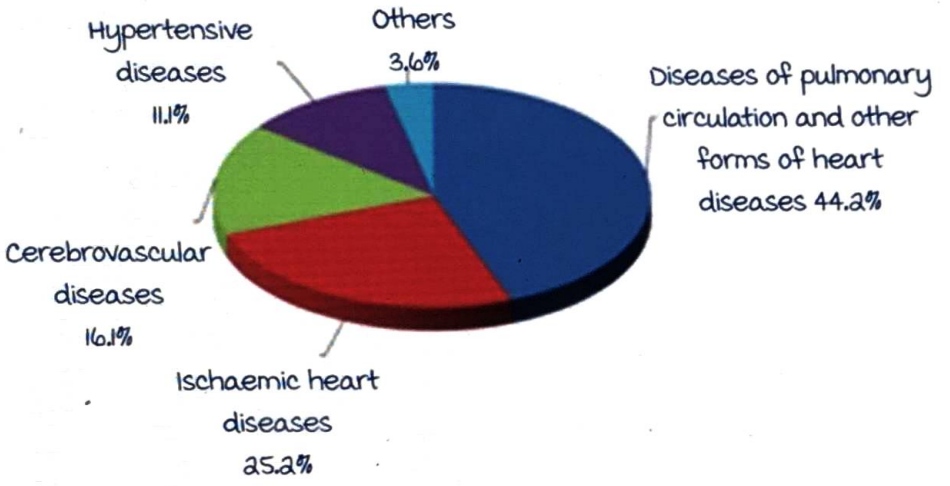
- most common cause of death due to diseases of the circulatory system was ischemic heart disease.
- most common cause of death due to infectious and parasitic diseases was septicemia.
- most common cause of death due to endocrine, nutritional & metabolic diseases was diabetes mellitus.
- most common single infection in India for causing death due to infectious disease was tuberculosis.

Active space

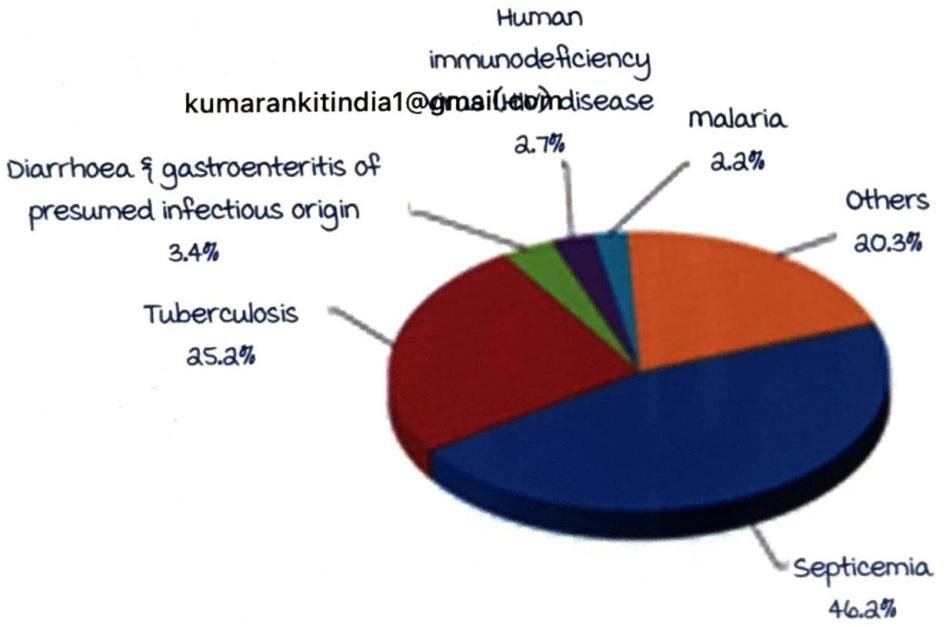
Percentage distribution of medically certified deaths due to endocrine, nutritional & metabolic diseases – 2019



Percentage distribution of medically certified deaths due to diseases of circulatory system – 2019



Percentage distribution of medically certified deaths due to infectious & parasitic diseases – 2019



Infant (< 1 year old) mortality

00:04:03

S. No.	Cause of death	Male		Female		Total	
		Number	%	Number	%	Number	%
1	Certain conditions originating in the perinatal period (P00–P96)	50590	70.5	34231	71.6	84821	71
i)	Hypoxia, birth asphyxia and other respiratory conditions.	19787	27.6	13206	27.6	32993	27.6
ii)	Slow fetal growth, fetal malnutrition and immaturity.	16479	23	11786	24.6	28265	23.6
2	Certain infectious and parasitic diseases (A00–B99)	4800	6.7	3312	6.9	8112	6.8
i)	Septicemia	3688	5.1	2497	5.2	6185	5.2
3	Diseases of the respiratory system (J00–J98)	3926	5.5	2387	5	6313	5.3
i)	Pneumonia	1757	2.5	1143	2.4	2900	2.4
4	Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	3467	4.8	2174	4.5	5641	4.7
i)	Congenital malformations of the cirulatory system	2326	3.2	1420	3	3746	3.1
5	Diseases of the circulatory system (I00–I99)	2177	3	1478	3.1	3655	3.1
i)	All forms of heart diseases including pulmonary circulation	1595	2.2	1110	2.3	2705	2.3
	Total infant deaths	71712		47832		119544	

most common cause of death in infants is conditions originating in perinatal period : Hypoxia, birth asphyxia and other respiratory conditions (27.6%) > slow fetal growth, fetal malnutrition and prematurity/ immaturity (23.6%).

2nd most important cause is infectious and parasitic diseases : Septicemia > pneumonia.

Active space

60c6b3eeaa8ded0e4e7e5ea7

Age group 1 – 4 years :

Rank	Causes of death	Male		Female		Total	
		No.	%	No.	%	No.	%
1	Certain infectious & parasitic diseases (A00–B99)	2163	22.4	1773	23.6	3936	22.9
i)	Septicemia	1058	11.0	904	12.0	1962	11.4
ii)	Diarrhoea and gastroenteritis of presumed infectious origin	177	1.8	144	1.9	321	1.9
iii)	Malaria	37	0.4	38	0.5	75	0.4
2	Diseases of respiratory system (J00–J98)	1529	15.8	1298	17.3	2827	16.5
i)	Pneumonia	758	7.9	653	8.7	1411	8.2
3	Diseases of circulatory system (I00–I99)	928	9.6	723	9.6	1651	9.6
i)	All forms of heart diseases including pulmonary circulation	698	7.2	555	7.4	1253	7.3
4	Diseases of the nervous system (G00–G98)	792	8.2	585	7.8	1377	8.0
i)	Inflammatory diseases of the central nervous system	403	4.2	327	4.4	730	4.3
5	Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	795	8.2	525	7.0	1320	7.7
i)	Congenital malformations of the circulatory system	579	6.0	376	5.0	955	5.6
	Total deaths (1–4 years)	9651		7516		17167	

Most common cause of death in children aged 1 – 4 years is infectious and parasitic diseases : Septicemia (11%) > pneumonia (8%) > diarrhoea (2%) > malaria (0.4%).

Active space

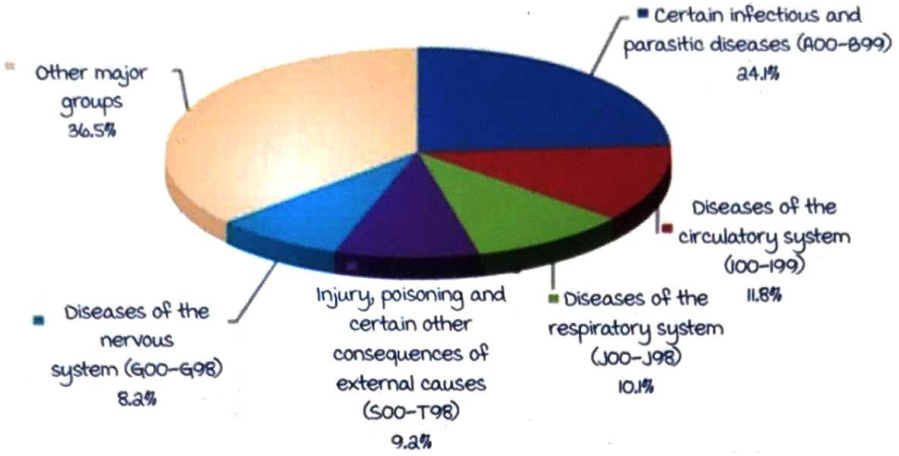
Age group 0-4 years :

Rank	Causes of death	Male		Female		Total	
		Number	%	Number	%	Number	%
1	Certain conditions originating in perinatal period (P00-P96)	50590	62.2	34231	61.8	84821	62.0
i)	Hypoxia, birth asphyxia & other respiratory conditions	19787	24.3	13206	23.9	32993	24.1
ii)	Slow fetal growth, fetal malnutrition and immaturity	16479	20.3	11786	21.3	28265	20.7
2	Certain infectious & parasitic diseases (A00-B99)	6963	8.6	5085	9.2	12048	8.8
i)	Septicemia	4746	5.8	3401	6.1	8147	6.0
ii)	Diarrhoea	396	0.5	338	0.6	734	0.5
iii)	Malaria	44	0.1	46	0.1	90	0.1
3	Diseases of respiratory System (J00-J98)	5455	6.7	3685	6.7	9140	6.7
i)	Pneumonia	2515	3.1	1796	3.2	4311	3.2
4	Congenital malformations, deformations & chromosomal abnormalities (Q00-Q99)	4262	5.2	2699	4.9	6961	5.1
i)	Congenital malformations of the circulatory system	2905	3.6	1796	3.2	4701	3.4
5	Diseases of circulatory system (I00-I99)	3105	3.8	2201	4.0	5306	3.9
i)	All forms of heart diseases including pulmonary circulation	2293	2.8	1665	3.0	3958	2.9
	Total deaths (0-4 years)	81363		55348		136711	

Most common cause of death in children aged 0 - 4 years is conditions originating in perinatal period : Hypoxia, birth asphyxia & other respiratory conditions > slow fetal growth, fetal malnutrition and immaturity/prematurity.

Age group 5 – 14 years :

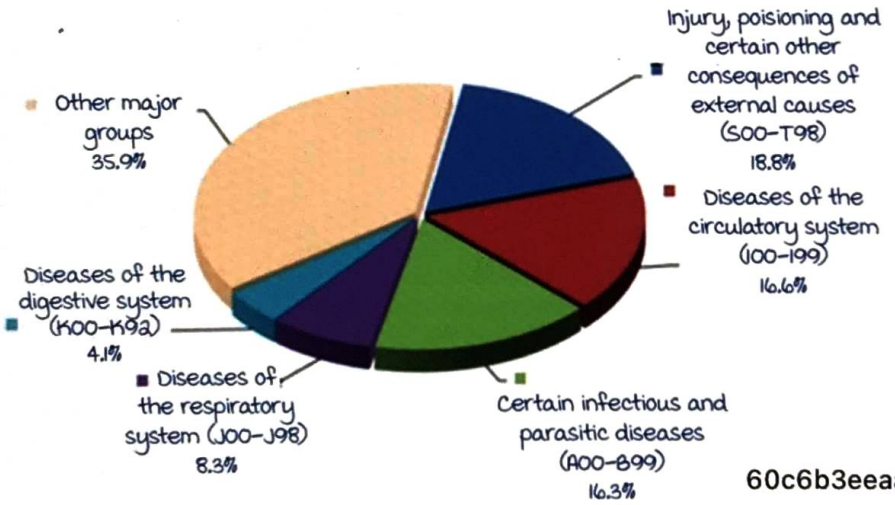
Percentage distribution of child deaths (5 to 14 years) by major cause groups – 2019



Most common cause of death in children aged 5 – 14 years is infectious and parasitic diseases > diseases of circulatory system > respiratory diseases.

Age group 15 – 24 years :

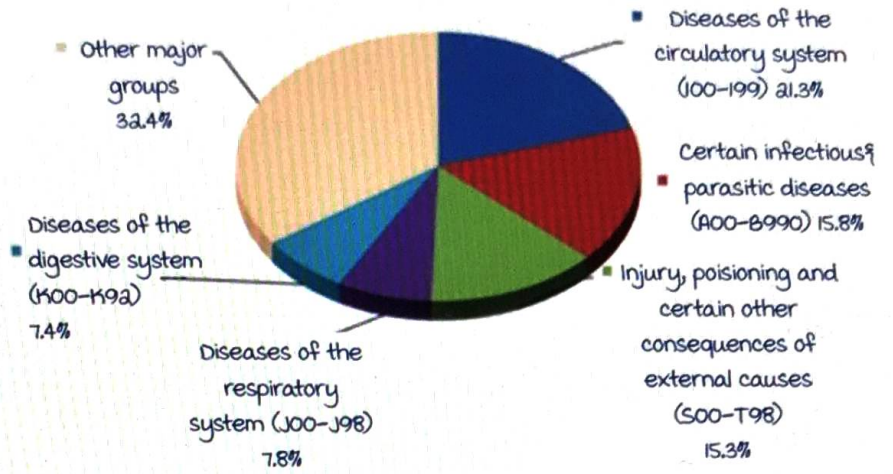
Percentage distribution of medically certified deaths in the age group 15 to 24 years by major cause groups – 2018



Most common cause of death in the age group 15 – 24 years is due to injury, poisoning & certain other consequences of external causes in a biologically fit person.
Next common cause of death is cardiovascular diseases.

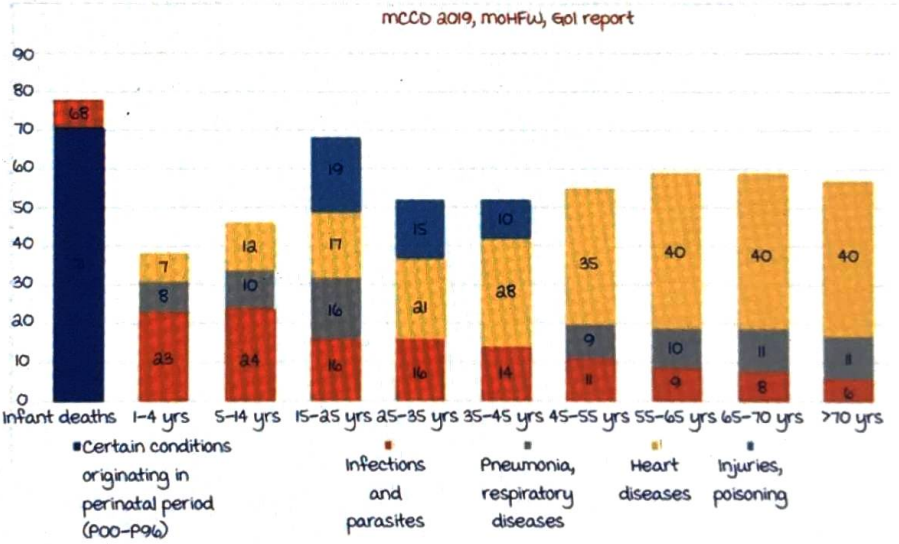
Age group 25 – 34 years :

Percentage distribution of medically certified deaths in the age group 25 to 34 years by major cause groups – 2018



Most common cause of death in the age group 25 – 34 years is diseases of the cardiovascular system.

Image summary :



Pre – adolescent age group : Cause of death is predominantly due to infections. 60c6b3eeaa8ded0e4e7e5ea7

Adolescent age group : Injuries are the most common cause.

Post – adolescence : Cardiovascular deaths dominate.

Active space

Age group	most common cause of death
Infants	Hypoxia > prematurity
1 – 4 years	Infections (septicemia > pneumonia > diarrhoea)
5 – 15 years	Infections
15 – 25 years	Injuries, poisoning
>25 years	Heart diseases (23 – 40%)

Category	Cause of death
most common cause of death in infants	Certain conditions originating in perinatal period
most common perinatal period reason	Hypoxia > prematurity
most common cause of infections in under 5 child	Septicemia > pneumonia > diarrhoea > malaria
most common cause of respiratory related death	Pneumonia

medical certification of cause of death (MCCD) was released in 2019 by the Government of India under the office of Registrar General of India.

Death certificates

00:16:36

Civil registration system (CRS) takes care of births & deaths in the country under the Registrar General of India.
Death certificate is subclassified into :

Part 1 : Direct cause of death.
Part 2 : Associated features that may be indirectly related to death.
Other sections : manner of death, pregnancy related death, tobacco smoking etc.

Part I is subclassified into Ia, Ib, Ic and so on.

Ia is the immediate cause of death (last diagnosis before the death).

Ib, Ic etc. are antecedent causes. Ib will cause Ia, Ic will cause Ib and so on (Ic Ib ⟶ Ia). ⟶

For Hospital Events

APPENDIX - II

FORM NO. 4
(See Rule 7)
MEDICAL CERTIFICATE OF CAUSE OF DEATH
(Hospital In-patients. Not to be used for still births)
To be sent to Registrar along with Form No. 2 (Death Report)

Name of the Hospital .....

I hereby certify that the person whose particulars are given below died in the hospital in Ward No..... On .....
At .....AM/PM

NAME OF DECEASED					For use of Statistical Office
Sex	Age at Death				
	If 1 year or more, age in years	If less than 1 year, age in month	If less than one month, age in days	If less than one day, age in hours	
1. Male 2. Female					

CAUSE OF DEATH		Interval between onset and death approx.
I Immediate cause State the disease, injury or complication which caused death, not the mode of dying such as heart failure, asthenia, etc.	(a) ..... due to (or as a consequences of)	
Antecedent cause Morbid conditions, if any, giving rise to the above cause, stating underlying conditions last	(b) ..... due to (or as a consequences of)	
	(c)	
II Other significant conditions contributing to the death but not related to the disease or condition causing it	....	

Manner of Death

How did the injury occur?

1. Natural 2. Accident 3. Suicide 4. Homicide
5. Pending investigation

If deceased was a female, was pregnancy the death associated with? 1. Yes 2. No
If yes, was there a delivery? 1. Yes 2. No

Part 2 in a death certificate is written with other causes.

Manner of death will be mentioned by the investigating officer in case of homicide/ suicide/ accident.

Pregnancy associated death with/ without delivery of the baby should be mentioned.

Death certificate is form number 4. It is a part of appendix II.

Two types of death certificates :

- For hospital events.
- For non – hospital events.

Difference in death certificate between hospital events and non – hospital events is the manner of death. It is not a part of non – hospital events death certificate.

For Non-Hospital Events

APPENDIX - III

FORM NO. 4A

(See Rule 7)

MEDICAL CERTIFICATE OF CAUSE OF DEATH

(For non-institutional deaths. Not to be used for still births)

To be sent to Registrar along with Form No. 2 (Death Report)

I hereby certify that the deceased Shri/Smt/Km. ..... son/wife/daughter of .....
resident of ..... was under my treatment from ..... to .....
..... and he/she died on ..... at .....A.M./P.M.

NAME OF DECEASED					For use of Statistical Office
Sex	Age at Death				
	If 1 year or more, age in years	If less than 1 year, age in month	If less than one month, age in days	If less than one day, age in hours	
3. Male 4. Female					
CAUSE OF DEATH				Interval between onset and death approx.	
I Immediate cause State the disease, injury or complication which caused death, not the mode of dying such as heart failure, asthenia, etc.	(a) ..... due to (or as a consequences of)				
Antecedent cause Morbid conditions, if any, giving rise to the above cause, stating underlying conditions last	(b) ..... due to (or as a consequences of)				
II Other significant conditions contributing to the death but not related to the disease or condition causing it	(c)				

If deceased was a female, was pregnancy the death associated with? 1. Yes .2. No
If yes, was there a delivery? 1. Yes 2. No

MCQ 1 :

Which of the following is not a part of non-hospital based medical certification of cause of death ?

A. Part Ib.

B. Manner of death.

C. Details of pregnancy related death.

D. Interval between onset of disease and death.

Answer : B. Manner of death.

Make a death certificate for Mr. A

A 60 year old male, presented to emergency with sharp epigastric pain and vomiting since 48 hours. He had BMI of 33 with history of chronic alcoholism and smoking. The patient was admitted with diagnosis of acute exacerbation of chronic pancreatitis, but while on management, on day 2, the patient developed cardiorespiratory arrest and died.

Answer (Do not use abbreviations in a death certificate)

Ia : Acute exacerbation of chronic pancreatitis.

Active space

Ib : Chronic pancreatitis.

Ic : Chronic alcoholism.

Other causes : Smoking, obesity.

make a death certificate for mr. B

A 70 year old male, admitted to hospital with lower quadrant pain for many weeks duration. There was progressive malaise and weakness. O/E the patient has enlarged liver four finger depth below the costal margin. The ECG shows a RBBB, and CT shows numerous masses in liver. The needle biopsy was diagnostic for moderately differentiated HCC and patient was started on chemotherapy.
Later the patient developed DVT of lower limb and admitted to hospital with malaise and shortness of breath. On day 4 of admission, the patient developed pulmonary embolism and died after a massive cardiorespiratory arrest.

Answer :

Ia : Pulmonary embolism.

Ib : Deep vein thrombosis.

Ic : End stage liver disease.

Id : Hepatocellular cancer.

Other causes : Right bundle branch block (arrhythmia).

make a death certificate for mr. C

A 70-year old male, known case of carcinoma esophagus, with relapse and pulmonary metastasis, on chemotherapy reported to hospital for acute shortness of breath with suspicion of COVID 19. A bronchial stenting was done for the bronchial metastatic infiltrates, later on day 3, the patient again developed acute shortness of breath with fall in SpO_a. Subsequently, he developed nosocomial pneumonia, and patient was managed with high end antibiotics, for which he failed to respond and died due to cardiorespiratory arrest on day 4 of admission.

Answer :

Ia : Nosocomial pneumonia.

Ib : Pulmonary metastasis.

Ic : Carcinoma esophagus.

Other causes : ---

Active space

Make a death certificate for Mr. D

A 50 year old male, old case of CCF with adrenal cancer with primary hyperaldosteronism is admitted to hospital for sudden loss of consciousness after an episode of vomiting just 30 mins ago. The CT head shows massive cerebellar hemorrhage. He was on high end dose for management of malignant hypertension. The patient died after 2 hours of hospital admission following a massive cardiac arrest.

Answer :

Ia : Aspiration of gastric contents.

Ib : Cerebellar hemorrhage.

Ic : Malignant hypertension.

Id : Adrenal cancer.

Other causes/part II : Congestive heart failure.

FAMILY PLANNING AND CONTRACEPTION : PART - 1

Eligible couple :
A couple where the female is in WRA (women of reproductive age).
Contraception is used for eligible couples.

Target couple :
A couple who has completed the family or has at least 1 live child.
Sterilization or permanent family methods are used for target couples.

Planned family :
Age of female at the time of birth of 1st child is > 20 yrs.
The 1st child is born after 2 yrs of marriage.
The gap between two children is > 3 yrs.
Has no unwanted pregnancies.

Failure rate of contraception

00:04:18

Life table analysis : Ideal method.
Best method to calculate failure rate of contraception.

Pearl's index :
most important indicator for family planning.
measures accidental pregnancies.
measured in terms of per hundred women years (HWY).

$$\frac{\text{Total number of accidental pregnancies}}{\text{Women years of exposure}} \times 100$$

Women years of exposure = Total women × years of use of contraception (or months of exposure/12).

Active space

$$\frac{\text{Total number of accidental pregnancies}}{\text{Women months of exposure}} \times 1200$$

Contraceptive method	Pearl's index
Condoms/barrier methods	2 – 20/HWY
IUD	0.7 – 1.5/HWY
OCPs	< 0.1 /HWY

Contraception :

Temporary methods	Permanent methods
Natural, barrier, IUD, OCP, Implants, Injectables, others.	Tubectomy, vasectomy, others.

Natural methods

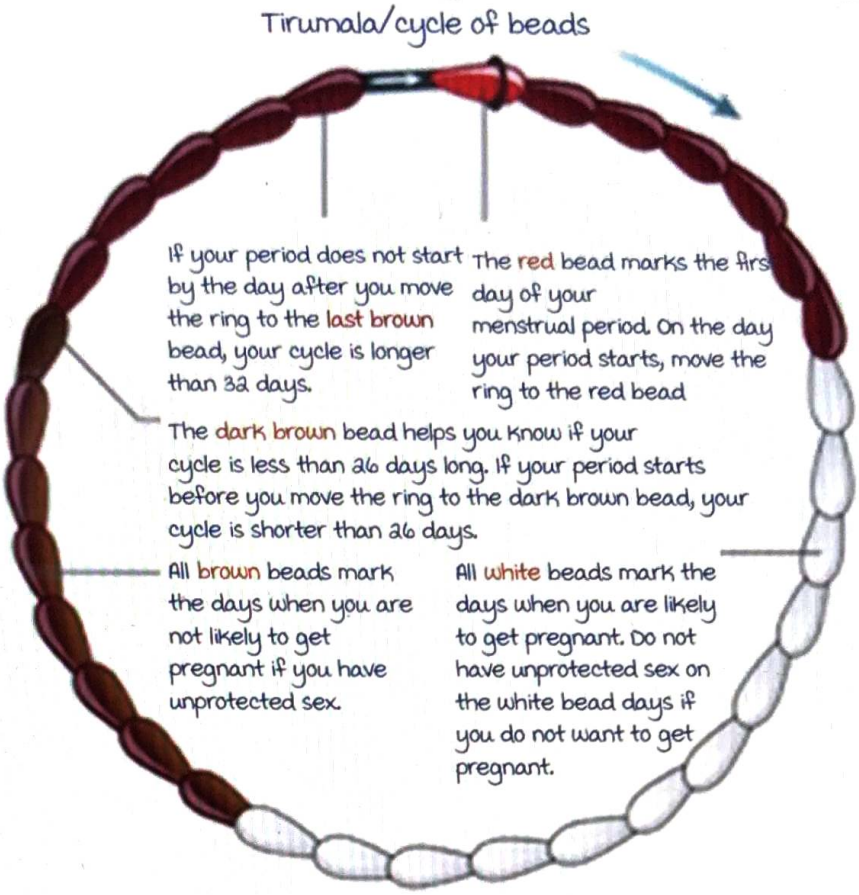
00:09:43

1. Abstinence : Avoidance of sexual intercourse.
2. Coitus interruptus/withdrawal method.
3. Calendar/rhythm method : Avoidance of sexual intercourse during the fertile phase of menstrual cycle called as the unsafe period.

Tirumala method/cycle of beads :
Red bead : Signifies 1st day of menstrual cycle.
Brown/yellow beads : Signifies safe period.
White beads : Signifies unsafe period.

Can be used for menstrual cycles of 26–31 days.
Disadvantage : Cannot be used in females with irregular cycles or with very short/long menstrual cycles.

1. Lactational amenorrhea : Physiological response by the body. Contraception of choice during lactational amenorrhea is POP (progesterone only pills).



2. Basal body temperature method : Rise of body temperature by 0.5–0.8 degree just before ovulation. more useful to ascertain fertility.
3. Cervical mucus thinning method/Billings method : Cervical mucous becomes thin, copious during the ovulatory period. more specific for finding fertility.

Combining basal body temperature and cervical mucus thinning method (or any other natural method) together is termed as symptothermal method.

Barrier methods

00:21:28

Male condoms	Female condoms
Has 1 ring.	Has 2 rings : Internal(closed) and external(open) rings.
Made of latex Available as Nirodh at all GOI health centres under NFPP. Manufactured at Hindustan latex limited, Trivandrum, Kerala.	FC 1 is made of polyurethane (not used). FC 2 is made of latex and available in India under NACO programme. FC 3.

Male condoms are slightly better at preventing RTI/STIs (reproductive tract/sexually transmitted infections).

Available but not recommended by Govt. of India (GOI) health programmes :

Cervical Caps :

U shaped cap that covers the cervix.

Cervical diaphragm/Dutch cap :

Covers the cervix. More flattened.

Vaginal sponge :

Today (brand name) contains spermicidal : Nonoxynol 9.

All three should be kept in the vaginal tract for 6-8 hours.

Not more than 24 hours.

After 24 hours, risk for toxic shock syndrome increases massively.

Dutch Cap

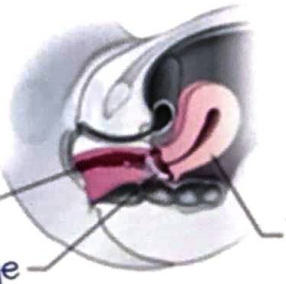
Cervical cap

Cervical diaphragm

Vaginal sponge

60c6b3eeaa8ded0e4e7e5ea7

sponge



Active space

Intra-uterine contraceptive devices (IUCDs)

00:31:04

Richard Richter introduced IUDs for the 1st time.

Grafenberg is known as the father of IUDs.

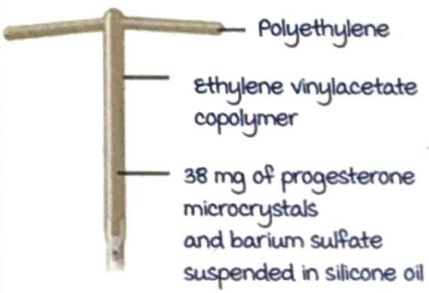
	Type	Example
First generation	Inert	Lippe's loop, Graffenberg's ring.
Second generation	Cu containing	CuT 200, CuT 220, CuT 380, Multiload CuT (250, 375).
Third generation	Hormonal	Mirena (LNG-20), Progestasert

IUCDs recommended by GOI are :

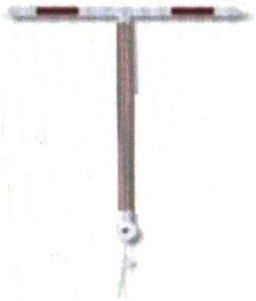
CuT 380 : Life span of 10 yrs.

CuT 375 : Life span of 5 yrs (short term IUCD).

Mirena : Life span of 5-7 yrs.

	Mirena	Progestasert
Composition	Levonorgestrel	Natural progestin
Depot	52 mg	38 mg
Releasing rate	20 mcg/day	65 mcg/day
Life span	5 years	1 year
Shape	Tubular T shaped structure with curved ends. 	Tubular T shaped structure. 

Active space

CuT 380A	Multiload 375
Cu containing T- shaped IUCD. Cu is present in a surface area of 380 mm^2. A : Signifies presence of Cu on the arms as well. Plunger rod and an inserter is present. Inserted by a withdrawal/ pull technique. Polyethylene thread is present. White in colour. 	It is an inverted U shaped device. Cu is present in a surface area of 375 mm^2. No Cu on the arms. Spurs are present on the arms that help in myometrial attachment. No plunger rod present. Monofilament nylon thread is present (bluish green in color). 

IUD : Mechanism of action :

- Inhibit fertilization via biochemical changes in cervical mucus and inhibit sperm motility.
- Causes thickening of cervical mucus.
- Inhibit implantation via foreign body reaction.

Timings of IUD insertions :

Post placental IUD insertion :

Within 10 min of normal vaginal delivery.

Post partum IUCD insertion :

After 10 min of normal vaginal delivery but within 48 hours.

IUCD should not be inserted after 48 hours of post delivery.

Interval insertion :

After 6 weeks (42 days) of normal delivery.

Intra cesarean IUCD insertion :

In case of C-section IUCD is inserted intra-op as it cannot be inserted after the procedure.

In a normal female, IUCD can be inserted anytime provided we rule out pregnancy.

Best time to insert IUCD : Within first 10 days of menstrual cycle. Ideal time is within first 5 days.

After abortion, best time for IUCD insertion is within 12 days of a surgical procedure, while on or around 15th day in case of a medical termination after ruling out any infection or retained products.

IUCD side effects :

- Pain : Most common reason for IUCD removal.
- Bleeding/spotting : Most common side effect.
- Perforation.
- Pelvic inflammatory disease.
- Ectopic pregnancy : Particularly a side effect of 3rd generation IUCDs. Not a contraindication for IUCD insertion according to GOI recommendations.

IUD contraindications :

Absolute :

- Suspected pregnancy.
- Pelvic inflammatory disease.
- Vaginal bleeding of undiagnosed aetiology.
- Cancer of the cervix, uterus or adnexa and other pelvic tumours.

Relative :

- Anaemia.
- Menorrhagia.
- History of PID since last pregnancy.
- Purulent cervical discharge.
- Distortions of the uterine cavity due to congenital malformations, fibroids.
- Unmotivated person.

FAMILY PLANNING AND CONTRACEPTION : PART - 2

Oral contraceptive pills 00:00:13

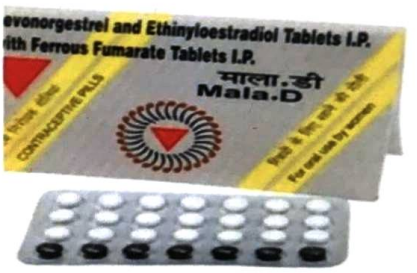
Oral combined pill contains estrogen and progesterone.

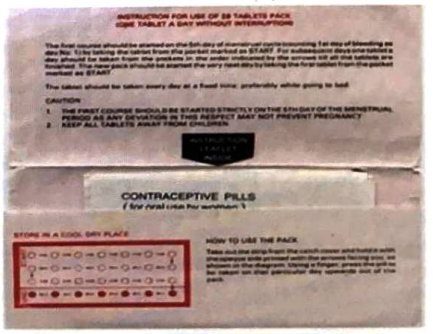
OCPs available in India :

- Mala N : Ethinyl estradiol (0.03mg) and Levonorgestrel (0.15mg). Given free of cost in India.
- Mala D : Ethinyl estradiol (0.03mg) and Levonorgestrel (0.15mg). Available under social marketing scheme (SMS). ASHA workers are given incentives to home deliver these pills at the rate of ₹ 1 / packet of OCPs.

Both Mala D & N contains 21 hormonal tablets and 7 iron sulphate tablets (total of 28).

60c6b3eeaa8ded0e4e7e5ea7





Active space

main type
A. MALA-D : (Lvonorgestrel 0.15mg + Ethinyl estradiol 0.03mg) Packet of 28. 21 are white and 7 are brown coloured containing Ferrous fumarate. (Rs : 3 ₹).
B. MALA-N : (Levonorgestrel 0.15mg + EE 0.03mg) Packet of 28 tabs. Govt. supply.

mechanism of action
A. Prevents ovulation.
B. Prevents implantation.
C. Makes cervical secretions thick.

Effectiveness
100% effective if taken correctly.

Side effects of OCPs :

- Metabolic :
  - Obesity.
  - Dyslipidemia.
- Cardiovascular (atherosclerosis) :
  - Hypertension.
  - Coronary artery disease (CAD).
  - Cerebrovascular stroke.
  - Deep vein thrombosis (DVT).
  - Pulmonary embolisms and other thromboembolisms.
- Malignant potential/cancer :
  - OCPs tend to promote cervical cancer (single best answer) > breast cancers. It also promotes hepatic cancers as well.
    OCPs are protective against ovarian (single best answer) > endometrial cancers.

Contraindications of OCPs :

- Pregnancy.
- Age > 40 years. If the woman is a smoker, age > 35.
- Undiagnosed uterine bleeding.
- History of thromboembolism or DVT.

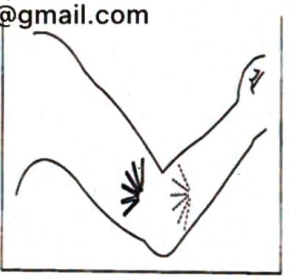
- History of CAD or CV stroke.
- Advanced stage liver disease.
- Women with breast cancer or any genital cancers.

Mechanism of action (MOA) of OCPs :
Exogenous source of estrogen and progesterone suppresses the endogenous production of the hormones.
Sudden cessation of the pills on the 21st day will cause withdrawal bleeding.
The MOA of OCPs is by causing anovulatory cycles.
There is no effect over fertilization and implantation.

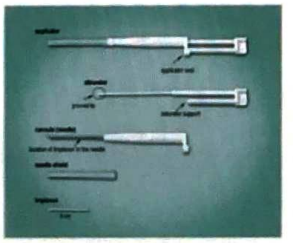
Injectables and implants 00:14:20

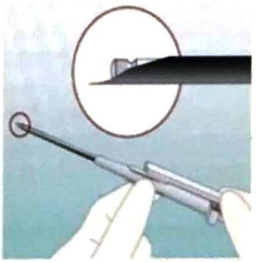
Subdermal implants :

- Norplant : Made of silastic material (silicon and plastic).
  Different types are available (R_6, R_4, R_2 or R).
  (R= Silastic rods)



- Implanon and Nexplanon : Contains Etonogesterel.
  Secretes around 60 – 70 µg/day for 30 – 60 days after insertion.
  It secretes 25 – 30 µg/day for the remaining part of its life. They are more advanced than the conventional Norplant.
  It is effective for ~3 years.





Implanon

Active space

Nexplanon is usually inserted at the back of forearm or upper arm.
Only one person is required to insert the device.
Both the devices are easy to use and are associated with lesser side effects.

Nexplanon (single best answer) and Implanon has the least failure rate.
Nexplanon is more radiopaque and is easier to insert compared to Implanon.

Nexplanon

Depot medroxy progesterone acetate (DMPA) :
150mg intramuscular injection repeated every 90 days (3 monthly).
Norethisterone enanthate (NET-EN) : 200mg intramuscular injection given 2 monthly.

60c6b3eeaa8ded0e4e7e5ea7

Subcutaneous DMPA (SC DMPA) : 104 mg repeated every 3 months.
Indian government provides free DMPA injections by the name of Antara.
Antara is launched by the ministry of health and family welfare.
It is suitable in conditions where OCPs and intrauterine devices are contraindicated.
While injecting, clean the area and air dry before the IM injection.

Antara

Active space

Other methods of Contraception 00:21:18

Centchroman :
Weekly pill. Contains 30 mg of methoxy chroman hydrochloride.

which forms an active metabolite called Ormiloxifen.
The pill was made available by the government of India by the name of Saheli. It is currently available by the name Chhaya.

MOA : It is a selective estrogen receptor modulator (SERM). It is a nonhormonal OCP.
It is given twice weekly for the first 3 months followed by once weekly in the subsequent months.
Centchroman is a highly potent OCP but is associated with high failure rate due to low compliance. Chhaya has high contraceptive efficiency and low effectivity.

Gossypol :
Chinese cotton seed extract and is a natural contraceptive.
MOA : Inhibits spermatogenesis. It is one of the few known male contraceptives.
Permanent azoospermia is a side effect.

Today :
Vaginal sponge with a spermicidal substance called Nonoxynol-9.
It is associated with a higher chance of toxic shock syndrome.

Gyneflix :
It is a rimless intra uterine device (IUD) comprising of a strong of copper tied with thread.

Emergency contraception :
It is provided to a woman in case of unprotected intercourse.

60c6b3eeaa8ded0e4e7e5ea7
Yuzpee method : Currently not recommended. A higher dose of OCPs is given for a short duration.
IUD is currently recommended as it is applicable till < 5 days of unprotected sex.

Levonorgestrel (LNG) : Earlier 0.75 mg was given within 72 hours and another dose of 0.75 mg given 12 hours of the first dose.
Currently LNG is given as a single dose tablet of 1.5 mg to be

Active space

taken within 72 hours of unprotected intercourse.
It is made available by the Government of India by the name of Ezy pill.
Ezy pill is a single dose LNG made available by the national family planning program.
The pill is also available as SMS package at the cost of ₹ 3/packet.

Mifepristone (3rd line drug. 1st line drug is Ezy pill & 2nd line is IUD).
It is given at the dose of 10 mg taken within 72 hours.

Indications for emergency contraceptive pills :

- Condom breakage or leakage.
- If the woman misses ≥ 3 doses of OCPs.
- Progesterone only pills (POP) delayed for > 3 hours.
- If there is a delay of > 2 weeks in NET-EN.
- If there is > 4 weeks delay in DMPA.
- Dislodgement or expulsion of IUD.
- Miscalculation of menstrual cycle.

Permanent methods of contraception 00:35:08

Permanent methods can be broadly classified into :

- Vasectomy in men : most common operative technique is non scalpel vasectomy (NSV).
- Tubectomy in women : Operative techniques include,
  Minilap : Can be performed by an MBBS doctor.
  Laparoscopic tubectomies by a trained professional gynaecologist.
  Most common technique followed is modified Pomeroy's technique in which the tubes are cut and ligated. Stumps are placed into the pelvic area.

For the same expenditure for 1 tubectomy, 5 vasectomies can be performed.
Vasectomy is hence the cost effective procedure.

Vasectomy :

The fibres are split open, the vas deferens is cut and ligated.

Complications include :

- Pain (most common) and infection.
- Formation of sperm granules. It can form after day 10–14. They are 5–8 mm hard mass which are palpable. The condition is self-limiting.
- Formation of antibodies to sperm. Anti-sperm antibodies are normally seen in 2% of men.
  Post-procedure, ~54 – 55% of men develop anti-sperm antibodies. The patient must be reassured that no complications arise from these antibodies.
  In case of recanalization, the chances of returning to fertility is slim due to the presence of anti-sperm antibodies.
- Spontaneous recanalization seen in 3 – 4% cases.
- Psychological complications.

Specific post operative advises after vasectomy :

- Patients must use alternate methods of contraception for 8 – 9 weeks (or 30 ejaculations) after the procedure.
- Keep the area clean (personal hygiene).
- Avoid lifting weights for 15days.
- Follow up at day 5, 10 and 15.

The failure rate of vasectomy is ~0.15 / hundred women years (HWY).

Most common reason for failure of vasectomy is misidentification of vas deferens.

Essure technique :

60c6b3eeaa8ded0e4e7e5ea7

A micro essure coil is inserted endoscopically into the fallopian tubes which causes fibrosis and eventual blockade of the tubes.

The fibrosis probably occurs after 6 weeks.

Hysterosalpingography (HSG) is done after 6 weeks to confirm the fibrosis.

Although it is a permanent method of sterilization, it is not commonly practiced.

Active space

Contraceptive effectivity

The effectivity of different contraceptives are :

- OCP : ~100% (99.9%).
- IUD : 95%.
  Pearl's index of IUD = 0.7 – 1.5/HWY.
  Mirena has the lowest failure rate (0.2 – 0.3/HWY).
  Progestasert has the lowest expulsion rate.
- Condoms : 60 – 70%.

Implanon/Nexplanon has the lowest failure rate (most effective contraceptives). Pearl index = < 0.05/HWY.

Equivalency sterilizations :

- 1 tubectomy = 1 sterilization.
- 1 vasectomy = 1 sterilization.
- 3 IUDs = 1 sterilization.
- 9 OCP users = 1 sterilization.
  An OCP user is woman who has used OCP for > 11 months.
- 18 condom user = 1 sterilization.
  A condom user is a person who has used 72 condoms in a year.

Contraception of choice :

- An unmarried woman who is sexually active :
  Barrier method (single best answer).
  Ideal contraceptive method is OCP + barrier method.
- Married woman who does not want to have children :
  OCPs.
  IUDs are not preferred as the woman has not yet delivered a baby and cervical os is closed.
- Married woman with one child who wants to delay the second child : IUDs (spacer devices) or OCPs.
- Married woman with 3 children who wants to delay the fourth child : Vasectomy > tubectomy.
- Married woman who wants to delay the first child : OCPs.
  If the patient does not want to take OCPs, Antara or Chhaya can be recommended.
  Chhaya is usually preferred in an educated woman.

Indications for tubectomy : Completion of family or at least one child.

Male contraceptives 01:01:00

These include :

- Gossypol.
- CaTsper gene : Ca^{a+} ions are required for sperm motility which enters via Ca^{a+} ion channels. CaTsper gene controls the Ca^{a+} ion channels. CaTsper gene blockers can be used as a contraceptive in both men and women.

- Drogestral male pill : Desogesterol (300 mcg) is given along with transdermal testosterone patch(5ng) inhibits spermatogenesis. It may be associated with electrolyte imbalance.
- Adjudin : Lonidamine analogue which is an anticancer drug. It is a hormonal male pill which inhibits spermatogenesis (sperm maturation).
- Reversible inhibition of sperm under guidance (RISUG) : It is an example for vaso occlusive contraception (VOC/ intravasal devices).

Valves are placed inside the vas deferens to block the sperms. These devices include :

- Intra vasal control valves : Bionyx.
- Vaso occlusive plugs/gels. Plugs may be made of synthetic materials or polymers.

RISUG is made of styrene maleic anhydride.
When injected inside the vas deferens it leads to occlusion and causes of destruction of sperms by throwing an electrical and biochemical changes.

Immunocontraception 01:05:45

Vaccines for contraception :

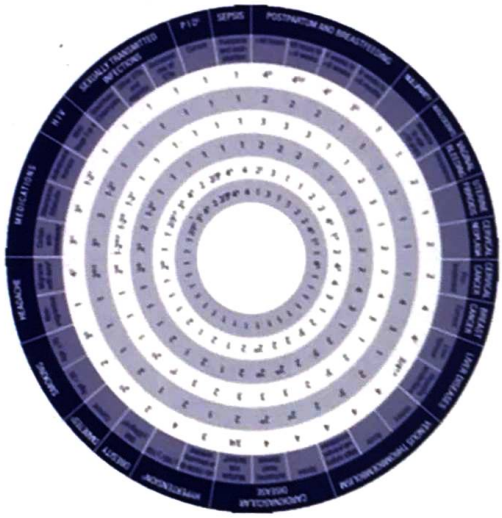
- Gamete production : At the level of hypothalamus or pituitary.
  1. Gonadotropin releasing hormone (GnRH) vaccines.
  2. Luteinizing hormone (LH) vaccine.
  3. Follicle stimulating hormone (FSH) vaccines.
- Gamete function :
  1. Sperm vaccine.
  2. Zona pellucida vaccine.

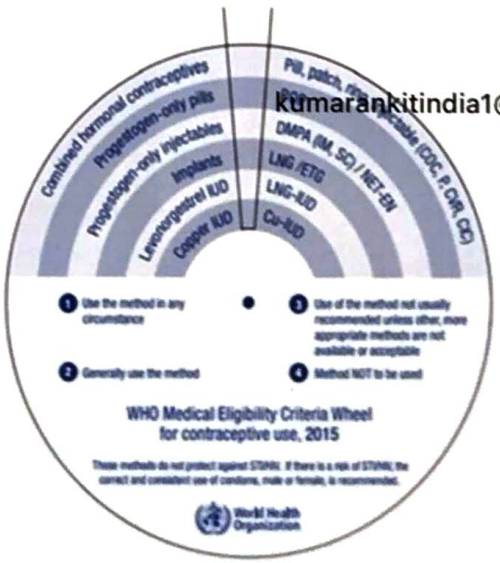
- Gamete outcome :
  1. Human chorionic gonadotropin (hCG) vaccine.

WHO medical eligibility criteria (MEC) wheel for contraceptive use :

It assesses 9 different contraceptives :

- Combined pills, COC (low dose combined oral contraceptives, with ≤ 35 mcg Ethinyl estradiol).
- Combined contraceptive patch (P).
- Combined contraceptive vaginal ring (CVR).
- Combined injectable contraceptives (CIC).
- Progestogen only pills (POP).
- Progestogen only injectables, DMPA (IM/SC)/NET-EN.
- Progestogen only implants, LNG/ETG (Levonorgestrel or Etonogestrel).
- Levonorgestrel releasing IUD (LNG-IUD).
- Copper bearing IUD (Cu-IUD).





NATIONAL FAMILY PLANNING PROGRAMME

Oldest programme in India, launched in the year 1952.
60c6b3eeaa8ded0e4e7e5ea7

Introduction 00:01:15

Theme : Boy or girl, 2 will do.
Sub theme : 2nd child only after 3 yrs of 1st child.
World population day (11th July every year) : To promote family planning and increase the awareness on burden of population on the planet.

Targets :

- Couple protection rate (CPR) > 60%
- Total fertility rate (TFR) < 2.1
  (total number of children, a female bears during her reproductive years).
- Net reproduction rate (NRR) : 1.
  (total number of daughters, a new born girl child will bear during her entire life assuming fixed age specific fertilities and age specific mortality patterns).

Strategies 00:03:59

1. Mission parivar vikas : To promote family planning and to decrease population explosion in certain districts.
   - Nayi pehel kit : Introduced by government of Uttar Pradesh for newly married couples, kits are provided with aim to promote family planning immediately after marriage, so the first child is at least 2 years after the marriage and to promote use of folic acid.
     The kit contains condoms, OCPs, a mirror, 2 towels, handkercheifs, etc in a jute bag to promote family planning and use of Folic acid.

Active space

Nayi pehel Kit

- Saarthi van : mobile vans which promote family planning, offer information and services at doorstep (districts).
- With the main focus 20-24 yrs age females.

2. Newer contraceptives :
   - Antara (medroxyprogesterone acetate : Inj 150mg IM).
   - Chaaya. weekly tablets containing Ormeloxifene (30mg)
   - EZY pill : Levonorgestrel (LNG) 1.5 mg as an emergency contraceptive.
   - Copper T : 380 A & 375 (multi load device).
   - Post-partum intra uterine copper device (PPIUCD) : Within 10 min to 48 hrs post partum.
   - Nirodh : male condoms.
   - Mala N & D.
3. Promotion of PPIUCD.
4. Social marketing scheme : Tied up with social workers and ASHA for home delivery of contraceptives.

ASHA : Rs. 1/pack of 3 condoms.
Rs. 2/3 for emergency contraceptive pill (EZY).
Rs. 1 for OCP.

5. COT scheme : Compensation for sterilization.

Clinical outreach team (COT) : These teams promote family planning methods.

Incentives for sterilizations :

	Non high focus states	High focus states	MPV
Tubectomy	600 (acceptor) /150 (ASHA)	1400(acceptor) / 200(ASHA)	2000(acceptor) / 300(ASHA)
Vasectomy	1100(acceptor) /200(ASHA)	2000(acceptor) / 300(ASHA)	3000(acceptor)/ 400(ASHA)
Postpartum sterilization		2200(acceptor)/ 300(ASHA)	

Active space

High focus states : Mnemonic : Bi MARU COJU.

Bihar.

Madhya Pradesh, Maharashtra.

Assam.

Rajasthan.

Uttar Pradesh.

Chhattisgarh.

Odisha.

Jharkhand.

Uttarakhand

These states are also called as Empowered Action Group states (EAG).

6. Pregnancy testing kits : Urine pregnancy testing kits given at free of cost called as nischay.
7. Family planning indemnity scheme : Health insurance scheme

National family planning indemnity scheme (NFPIS)	
Claim	Amount per case
Doctors/facilities covered for litigations upto 4 cases per year including defence cost	2,00,000
Death at hospital/within seven days of discharge	2,00,000
Death following sterilization (8^{th}–30^{th} day from discharge)	50000
Expense for treatment of medical complications	25000
Failure of sterilization	30000

8. Post abortion counselling :

method	Timing with abortion procedure
Female sterilization, post abortion	With abortion procedure or within 7 days
IUCD, post abortion	Within 12 days of abortion
OCPs, POPs, Antra, Condoms	Immediately

Active space

9. Fixed day static services : To promote tubectomy and vasectomy in every health facility under government of India & it observes at least 1 day for sterilization.
   District hospital : Twice weekly.
   Sub district hospital : Weekly.
   CHC : Fortnightly.
   PHC : Monthly.

Organisation

60b6b3e8aa8ded0e4e7e5ea7 00:20:46

Centre : Population advisory council (governing bodies and mass media director).
State : State family welfare bureau.
District : District family welfare bureau.

	Urban health post (smaller towns)	Urban family welfare centre (Larger cities)	
A	Less than 5000		
B	5000- 10000		
C	10,000-25,000	I	10,000-25,000
D	25,000-50,000	II	25,000-50,000
		III	more than 50,000

Village : Health workers, anganwadi workers, ASHA, villages health guide.

CNAA approach : Community Needs Assessment Approach.
Bottom-up approach.
People working at the lower level assess their population with their requirements and make their own targets which are then given to the higher levels.

Vasectomy fortnight : In last week of november and 1st week of december.

Contraceptives available :
At village level (ASHA/frontline workers) : OCPs, condoms, emergency contraceptives.

Active space

Sub centre and above : IUDs, injectables.

PHC : Vasectomy, minilap procedures.

CHC : Laparoscopic tubectomies.

International voluntary organisations :

- United Nations Fund For Population Activities : Supports no scalpel vasectomy.
- US Agency for International Development (USAID) : Supports tubectomies & permanent sterilization.
- International planned parenthood federation & Ford foundation : Permanent method of sterilization and newer oral methods of contraception in rural areas.
- The Pathfinder funds, Bill and Melinda gates : IT innovation in family planning.
- World Bank, WHO, UNICEF.

Evaluation of NFPP

00:30:29

1. Need : Population, eligible couples, target couples, people under 5 & < 1 yr.
2. Plans : Also called as process indicators.
3. Performance :
   - Service response/Utilizaton rates.
   - Cost analysis.
4. Effect : Knowledge, Attitude and Practices (KAP) studies.
5. Impact :
   - Family size (TFR : most important epidemiological indicator).
   - Desired number of children.
   - Birth interval (important).
   - Age of mother at first and last child.
   - Birth order.
   - Number of abortions.

Cafeteria approach :

- Used in family planning clinics.
- Choice of contraception is based on the patient not the service provider.

Incentives to ASHA for spacing :

Rs. 500 for delaying 1st child for 2 years after marriage.

Rs. 500 for delaying the 2nd child 3 years after the birth of 1st child.

Rs. 1000 in case couple opts for a permanent limiting method upto 2 children only.

Medical termination of pregnancy act 1971 00:38:57

MTP act passed in 1971 with major amendments in 2000 & 2020.

Causes : SHEFT

1. Social : The female is unable to take care of the child.
2. Humanitarian : Rape.
3. Eugenic : Fetus might not survive, chromosomal abnormalities.
4. Failure of contraception.
5. Therapeutic : Life saving.

Timing :

- < 20 weeks : Single doctor.
- 20 to 24 weeks in certain cases.
- > 24 weeks : If approved by a medical board.

Can be conducted by a registered medical practitioner :

Who has conducted 25 deliveries under supervision.

or

Having post graduation in degree/diploma in obstetrics and gynaecology.

or

MBBS doctors who have done >6 months junior residency in OBG department in any government hospital.

Place :

Any health facility which is government approved and has facility for either laparotomy or hysterectomy or major gynaecology surgery.

INDICATORS OF MCH CARE

Indicators in MCH

00:02:48

Infant Mortality Rate (IMR).
Maternal Mortality Ratio (MMR).
Perinatal Mortality Rate (PNMR).
Still Birth Rate (SBR).
Neonatal Mortality Rate (NNMR).
Child Death Rate (CDR).
Child Mortality Rate (CMR).
Child Survival Index (CSI).
Under 5 Mortality Rate (U5MR)

Period	Duration
Early neonatal period	Birth to 7 days of life
Late neonatal period	7 days to 28 days of life
Neonatal period	Birth to 28 days of life
Post neonatal period	28 days to 1 year of life
Perinatal period (still birth + early neonatal period)	28 weeks of gestation to 7 days of life

- Fetus : Product of conception that shows features of life (cardiac activity, organogenesis).
- Still birth : Any fetal death which is >28 weeks of gestation or >1000 grams in weight or >35 cms in crown rump length.
- Live birth : Birth of fetus that shows signs of life (crying, respiration or movement).
- Neonatal death : Any death which happens after live birth.
- Maternal death : Death of a female within 42 days of delivery due to pregnancy or related causes not including accidental/traumatic deaths or electrocution.

	Formula	Current	Target (SDG)	most common cause of death	Remarks
IMR	$\frac{\text{Infant death}}{\text{Live births}} \times 1000$	30/1000 live births		Hypoxia > Prematurity	Best indicator for development of a nation as per WHO.
NNMR	$\frac{\text{Neonatal deaths}}{\text{Live births}} \times 1000$	[illegible]/1000 live births	< 12 by 2030	Hypoxia > Prematurity	
SBR	$\frac{\text{Stillbirths}}{\text{Total births}} \times 1000$	5/1000 total births (national data) 13.9/1000 total births (WHO/UN)	< 10 by 2030		
PNMR	$\frac{\text{Stillbirths + early neonatal deaths}}{\text{Total births}} \times 1000$				Best indicator for health care facilities/ services.
U5MR	$\frac{\text{Under 5 deaths}}{\text{Live births}} \times 1000$	36/1000 live births	< 25 by 2030	Hypoxia > Prematurity	Best indicator for development of a nation as per United Nations.
MMR	$\frac{\text{Maternal deaths}}{\text{Live births}} \times 100000$	103/Lakh live births	< 70 by 2030	Postpartum hemorrhage	Best indicator for quality of delivery services.

- Maternal mortality rate :

$$\frac{\text{maternal deaths}}{\text{Total women in reproductive age (15 - 49 years)}} \times 100000$$

- Life time risk :

$$1 - \frac{1 - \text{maternal mortality rate}}{100000}$$

It gives probability of a women of reproductive age group to die because of child birth or related problems.
National objective for infant mortality rate : < 25 by year 2025.

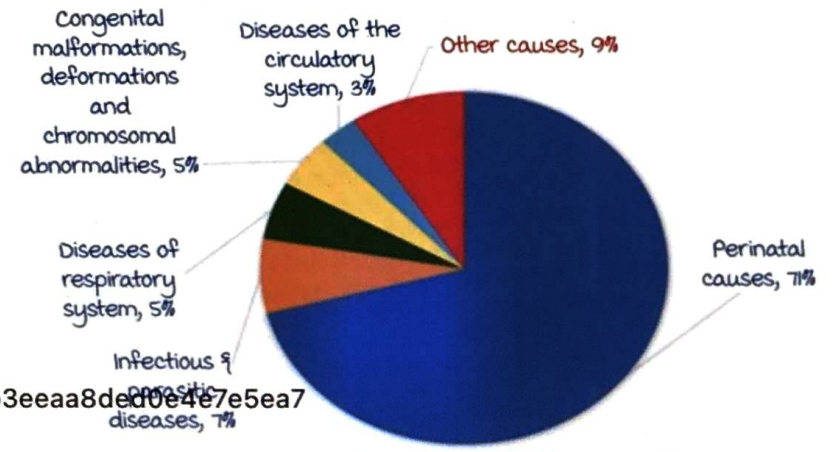
Active space

Most common causes

00:29:38

1. Infant mortality :
   most common cause : Hypoxia, birth asphyxia and other respiratory conditions > Slow fetal growth, fetal malnutrition and immaturity.

S. No.	Cause of death in infants	Male		Female		Total	
		Number	%	Number	%	Number	%
A.	Certain conditions originating in perinatal period (P00–P96)	50590	70.5	34231	71.6	84821	71.0
i)	Hypoxia, birth asphyxia and other respiratory conditions	19787	27.6	13206	27.6	32993	27.6
ii)	Slow fetal growth, fetal malnutrition and immaturity	16479	23.0	11786	24.6	28265	23.6
B.	Certain infectious & parasitic diseases (A00–B99)	4800	6.7	3312	6.9	8112	6.8
i)	Septicemia	3688	5.1	2497	5.2	6185	5.2
C.	Diseases of respiratory system (J00–J98)	3926	5.5	2387	5.0	6313	5.3
i)	Pneumonia	1757	2.5	1143	2.4	2900	2.4
D.	Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	3467	4.8	2174	4.5	5641	4.7
i)	Congenital malformations of the circulatory system	2326	3.2	1420	3.0	3746	3.1
E.	Diseases of the circulatory system (I00–I99)	2177	3.0	1478	3.1	3655	3.1
i)	All forms of heart diseases including pulmonary circulation	1595	2.2	1110	2.3	2705	2.3
	Total infant deaths	71712		47832		119544	

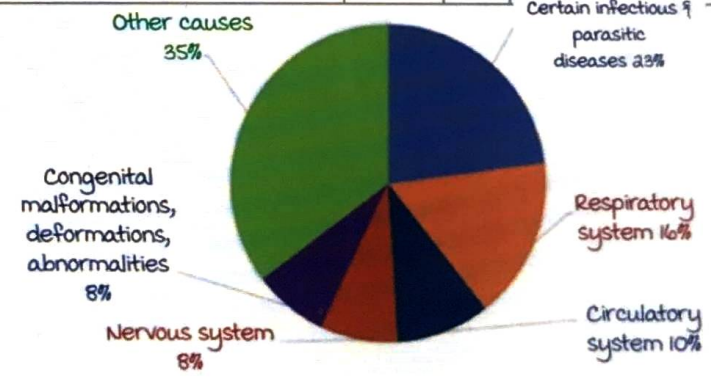


Pie chart for infant deaths (MCCD-2019)

Active space

2. Neonatal mortality :
   Most common cause : Hypoxia > Prematurity (slow fetal growth, fetal malnutrition and immaturity).
3. Under 5 mortality :
   Most common cause : Perinatal causes : Hypoxia > Prematurity.
4. 1-4 years mortality (Under 5 mortality infant mortality) :
   Most common cause : Infections and parasitic diseases (Septicemia > Pneumonia > Diarrhea).

S. No.	Cause of death (1-4 years of age)	Male		Female		Total	
		Number	%	Number	%	Number	%
A.	Certain infectious & parasitic diseases (A00-B99)	2163	22.4	1773	23.6	3936	22.9
i)	Septicemia	1058	11.0	904	12.0	1962	11.4
iii)	Diarrhoea and gastroenteritis of presumed infectious origin	177	1.8	144	1.9	321	1.9
ii)	Malaria	37	0.4	38	0.5	75	0.4
B.	Diseases of respiratory system (J00-J98)	1529	15.8	1298	17.3	2827	16.5
i)	Pneumonia	758	7.9	653	8.7	1411	8.2
C.	Diseases of circulatory system (I00-I990)	928	9.6	723	9.6	1651	9.6
i)	All forms of heart diseases including pulmonary circulation	698	7.2	555	7.4	1253	7.3
D.	Diseases of the nervous system (G00-G98)	792	8.2	585	7.8	1377	8.0
i)	Inflammatory diseases of the central nervous system	403	4.2	327	4.4	730	4.3
E.	Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	765	8.2	525	7.0	1320	7.7
i)	Congenital malformations of the circulatory system	579	6.0	376	5.0	955	5.6
	Total deaths (1-4 years)	9651		7516		17167	



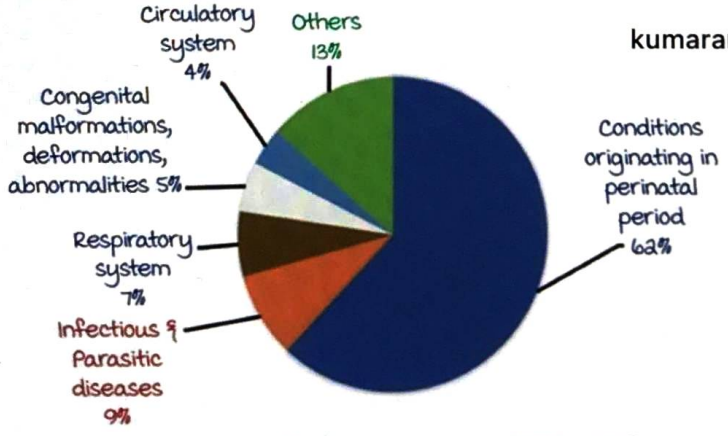
Pie chart for 1-4 year deaths (MCCD-2019)

Active space

5. 0-4 years mortality :

Most common cause : Conditions originating in perinatal period : Hypoxia and prematurity.

S. No.	Cause of death (0-4 years of age)	Male		Female		Total	
		Number	%	Number	%	Number	%
A.	Certain conditions originating in perinatal period (P00-P96)	50590	62.2	34231	61.8	84821	62.0
i)	Hypoxia, birth asphyxia and other respiratory conditions	19787	24.3	13206	23.9	32993	24.1
iii)	Slow fetal growth, fetal malnutrition and immaturity	16479	20.3	11786	21.3	28265	20.7
B.	Certain infectious & Parasitic diseases (A00-B99)	6963	8.6	5085	9.2	12048	8.8
i)	Septicemia	4746	5.8	3401	6.1	8147	6.0
ii)	Diarrhoea	396	0.5	338	0.6	734	0.5
iii)	Malaria	44	0.1	46	0.1	90	0.1
C.	Diseases of respiratory system (J00-J98)	5455	6.7	3685	6.7	9140	6.7
i)	Pneumonia	2515	3.1	1796	3.2	4311	3.2
D.	Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	4262	5.2	2699	4.9	6961	5.1
i)	Congenital malformations of the circulatory system	2905	3.6	1796	3.2	4701	3.4
E.	Diseases of circulatory system (I00-I99)	3105	3.8	2201	4.0	5306	3.9
i)	All forms of heart diseases including pulmonary circulation	2293	2.8	1665	3.0	3958	2.9
	Total deaths (0-4 years)	81363		55348		136711	



Pie chart for 0-4 year deaths (MCCD-2019)

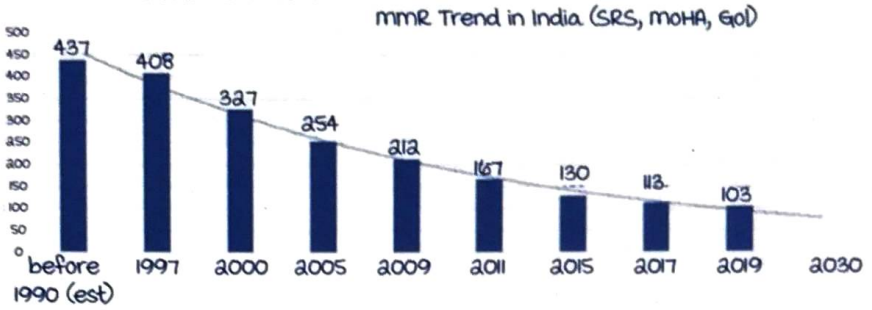
6. Maternal mortality :

Most common cause : Postpartum hemorrhage (PPH).

- Uterine atony : most common cause for PPH.

Uterine atony could be due to :

- Traumatic delivery.
- Grand multiparity.
- Prolonged labor/obstructed labor.
- Unskilled delivery.
- Severe anemia.
- Malnourishment.



Child death rate = Under 5 mortality rate − Infant mortality rate.

$$\frac{\text{Death of children of 1-4 age group}}{\text{Total children in 1-4 age group}} \times 1000$$

Child mortality rate = Under 5 mortality rate.

$$\frac{\text{Under 5 deaths}}{\text{Live births}} \times 1000$$

Child survival index :

$$\frac{1000 - \text{Under 5 mortality rate}}{10}$$

Active space

PREVENTIVE OBSTETRICS

Consists of antenatal care, intra natal care, postnatal care.

Antenatal care (ANC) 00:01:46

Number of visits :

WHO : 8 visits.

- 1st trimester : One visit.
- 2nd trimester : Two visits.
- 3rd trimester : Five visits.

Government of India mandates 4 visits.

- 1st visit : < 12 weeks (registration visit).
- 2nd visit : 14 – 26 weeks (visit 1).
- 3rd visit : 28 – 32 weeks (visit 2).
- 4th visit : 36 weeks till term (visit 3).

Average weight gain during the entire pregnancy is 9 – 11 Kg (ideal weight gain : 10 Kg).

Increase in weight should not be more than 2Kg/month after the 2nd trimester.

Past medical history should be asked.

Screening of anaemia : Cut-off for anaemia based on the Hb levels :

1. < 11 g/dL in pregnancy.
2. < 12g/dL in females.
3. < 13g/dL in males.

Screening of infections/diseases :

In rural areas,

1. Urine routine for sugar, proteins.
2. Malaria test (using Rapid Diagnostic Kit).

In urban areas,

1. Urine test.
2. Malaria test (using RDK/slide method).
3. Triple infection screening (HIV, VDRL, Hepatitis B).
4. Gestational diabetes mellitus.

Gestational diabetes mellitus/GDM screening 00:06:27

Within < 12 weeks of gestation, OGTT (Oral Glucose Tolerance Test) : 75 g of anhydrous glucose with a 1 step testing is done.
OGTT usually done at first registration visit.
Repeat OGTT between 24 - 26 weeks.
GDM diagnosis : Any one positive (> 140 mg/dL) out of the two OGTT tests done at 12 weeks and between 24 - 26 weeks.
If both OGTT is < 140 mg/dL, then GDM is ruled out.
GDM management :
Medical Nutritional Therapy (MNT) for 2 weeks.
OGTT is repeated after 2 weeks.

- If < 120 mg/dL : Continue MNT.
- If > 120 mg/dL : Insulin.

In India, approximately 10 - 11 % pregnant females have GDM, 1 - 2% of GDM patients have the requirement of insulin.

Diet in pregnancy 00:12:51

NIN (National Institute of Nutrition, Hyderabad) RDA guidelines (2020) :

Variable	Non pregnant	Pregnancy			Lactation	
		1st trimester	2nd trimester	3rd trimester	0 - 6 months	6 - 12 months
Body weight	55 kg	55 kg + 10 kg in entire pregnancy				
Energy (Kcal/day) Sedentary Moderate Heavy	 1660 2130 2720	+ 350			+600	+520
Proteins (g/day)	45.7	45.7	+ 9.5	+ 22	+ 16.9	+ 13.2
Carbohydrates (g/day)	130	175			200	
Fats (g/day)	20 - 30	20 - 30				
Iron (mg/day)	30	40			23	
Iodine (mcg/day)	160	250			280	
Calcium (mg/day)	1000	1000			1200	
Vit A (mcg/day)	840	900			950	
Folate (mcg/d)	220	570			330	

Anaemia Mukt Bharath/AMB Program 00:19:28

Under the ministry of Health and Family Welfare (MoHFW).

6 x 6 x 6 strategy :

- 6 beneficiaries.
- 6 institutional mechanism.
- 6 interventions.

Target : To reduce the prevalence of anaemia (from 2016 NFHS 4 data report) by approximately 1/3rd by 2022.

Beneficiaries :

- 6 – 59 months of age : All children.
- 5 – 9 years : All children.
- 10 – 19 years : All school going children and all girls out of school.
- 20 – 24 years : Females registered under mission Parivar Vikas (MPV).
- Pregnant females.
- Lactating females.

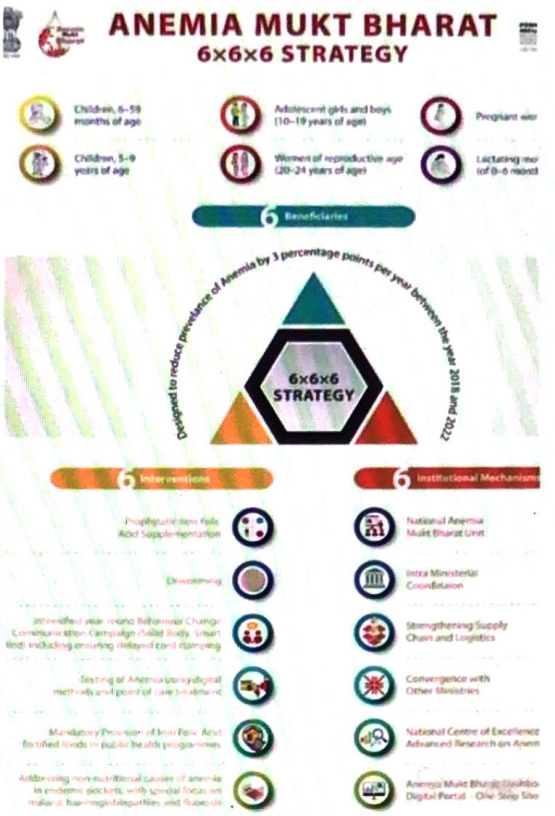
6 institution mechanisms :

- Intra Ministerial Coordination.
- National AMB unit.
- National Centre of Excellence and Advanced Research on Anaemia Control (NCEAR-A).
- Convergence with other ministries.
- Strengthening supply chain and logistics.
- Anaemia Mukt Bharat dashboard digital portal : One stop shop on anaemia.

6 interventions :

- IFA prophylaxis.
- Deworming.
- Intensified year round behaviour change communication : "solid body, smart mind".
- Anaemia testing using digital methods.
- IFA fortified foods (in all government given food in India).
- Non nutritional causes of anaemia (like malaria, fluorosis, hemoglobinopathies etc.).

Active space



IFA supplementation

00:26:27

Age group	Iron dose	FA	Timing	Color	Remarks
Children 6 – 59 months of age	20mg	100mcg	Biweekly	–	Liquid bottle with auto dispenser.
Children 5 – 9 years of age	45mg	400mcg	Weekly	Pink	Sugar coated
School going adolescent girls and boys, 10 – 19 years of age out of school adolescent girls	60mg	500mcg	Weekly	Blue	Sugar coated
Women of reproductive age (non pregnant, non lactating) 20 – 24 years (under MPV)	60mg	500mcg	Weekly	Red	Sugar coated
Pregnant women and lactating mothers (0 – 6 months child)	60mg	500mcg	Daily	Red	Sugar coated. From 4th month in pregnancy till 6 months in lactation.

Iron is teratogenic and is contraindicated in the 1st trimester.

Iron is supplemented for 1 year (6 months in pregnancy + 6 months lactation).

De worming given to all children 1 – 2 years.

Dose for <2 years : 200 mg ; > 2 years : 400 mg Albendazole.

Active space

Age group	Deworming
Children 6 – 59 months of age. 60c6b3eeaa8ded0e4e7e5ea7	Biannual dose of 400 mg Albendazole. ½ tablet to 12 – 24 months, 1 tablet to 24 – 59 months.
Children 5 – 9 years of age.	Biannual dose of 400 mg Albendazole (1 tablet).
School going adolescent girls and boys, 10 – 19 years of age. out of school adolescent girls, 10 – 19 years of age.	Biannual dose of 400mg Albendazole (1 tablet).
Women of reproductive age (non pregnant, non lactating) 20 – 24 years (under MPV).	Biannual dose of 400mg Albendazole (1 tablet).
Pregnant women and lactating mothers (0 – 6 months child).	One dose of 400mg Albendazole (1 tablet), after the 1st trimester, preferably during the 2nd trimester.

Biannual dose (2 times a year) on 10th of February and on 10th of August on National Deworming days.

Supplements in pregnancy :
IFA (60 mg + 500 mcg, daily) for 1 year (6 months pregnancy + 6 months lactation).
Deworming (Albendazole 1 tablet of 400 mg).
Calcium 500mg (should not be given with IFA because calcium will inhibit the absorption of iron, gap of 6 – 8 hours should be maintained).

Injections given in pregnancy :
2 doses of Td vaccine (smaller dose, d of 2LF) with a gap of 4 weeks is given for all pregnant females.
(not TD : Diphtheria dose is 25 LF or Limits of Flocculation).
Due to risk of hyperimmunization for tetanus toxoid vaccine, it is recommended that any female who has taken complete TT/Td immunization within last 3 years will get only 1 booster dose of Td.

Active space

Intranatal care (INC) 00:36:09

There should be a proper mechanism for safe delivery.
It should be conducted by a trained personnel and it should be a clean delivery.
Laqshya program : To provide good quality of labor room.
Controls delivery huts and First Referral units(FRU).
5 cleans of delivery and components of a Disposable Delivery Kit/DDK (available at all delivery points) :

- Clean surface : Sterile plastic sheet.
- Clean hands : Soap.
- Clean cord : Cotton/gauze piece.
- Clean clamp/tie : Thread.
- Clean cut : Blade.

Due to the implementation of 5 cleans principle, it was possible to achieve elimination levels of neonatal tetanus in September 2015.

Post natal care (PNC) 00:41:14

Objective :

- There should not be any bleeding.
- mother shouldnot have any disease/infections.
- Maintenance of proper hygiene post delivery.

Number of PNC visits :
WHO recommendation :

- Birth till 3 days : Twice daily.
- 3 days till the cord drops : Daily.
- Cord drop till 6 months : Monthly.
- 6 months till 1 year : Quarterly.

National Mission Health (NHM) guidelines for PNC visits :
Day 1, 3, 7, 42.
Atleast 3 times in 1st week & once in the 6th week (total 4 visits).
Objective : To have a healthy puerperium and prevent the risk of PPH and ensure health of the child.
In LBW babies : Day 1, 3, 7, 14, 21, 28, 42 (total 7 visits).

Active space

PREVENTIVE PAEDIATRICS : EARLY CARE

60c6b3eeaa8ded0e4e7e5ea7

Under 5 deaths, major share is due to infant mortality rate
Infant mortality rate, neonatal deaths take up the major share (50% within 0 – 2 days & other 50% by 2 – 7 days).

Preventive paediatrics

00:00:56

- Breast feeding.
- Care of new born child.
- Malnutrition indicators growth charts.

Early new born care :

APGAR score : Mnemonic : ABCDE.
Airways, Body (temperature & anomalies),
Cord care, Dermis care, Eye care.

APGAR score	0	1	2
Heart rate	Absent	Below 100	Over 100
Respiratory rate	Absent	Slow irregular	Good cry
Muscle tone	Limp	Some flexion	Active motion
Reflex	No response	Grimace	Cough, sneeze
Colour	Blue pale	Pink body, blue extremities	Body and limbs are pink

0 – 3 : Very severe or very poor score.
4 – 6 : Moderate.
7 or more : Normal score.

Airways should be clear.
Body temperature should be maintained.
Hypothermia is a common cause of death within 24 to 48 hrs.
Reason is loss of heat from head.

Warm chain : To maintain body temperature of the baby.
mother delivers the baby → Baby covered to prevent heat loss → Baby is weighed → Baby is covered back and given to the mother.

Cord care : Cord must be kept clean and nothing must be applied.

Dermis care : Bathing should be avoided for first 24hrs (till body temperature stabilizes with outside temperature).

Eye care : must be wiped with clean water or normal saline.

Weight :
Average weight is 2.8 to 3 Kgs.
Low birth weight : < 2500 grams.

- Weight : Checked within the 1st day.
- Length : Checked within 0 – 3 days.
- Head circumference : Checked within 0 – 3 days.

At risk baby

00:08:07

1. Birth weight < 2500 grams.
2. Weight below <70% expected weight.
3. Failure to gain weight in 3 months.
4. Protein Energy Malnutrition (PEM), diarrhoea.
5. Birth order 5.
6. Twins or more.
7. Artificial fed child.
8. Working mothers, single parents.

Low birth weight (LBW) : < 2500 gms. 60c6b3eeaa8ded0e4e7e5ea7
Reasons :
Prematurity.
Small for gestational age : IUGR (major determinant).
Formula : (Total no. of LBW babies /live birth) X 100 = %.
20 – 22% is the prevalence of LBW in India.

Active space

Term	Period of gestation
Preterm	<37 weeks/ <259 days
Moderate preterm	32 – 37 weeks
Very preterm	28 – 32 weeks
Extremely preterm	< 28 weeks
Term	37 – 42 weeks/ 259 – 293 days
Post term	> 42 weeks/ >294 days

Kangaroo Mother Care (KMC) :
Mother hugs the baby with skin to skin contact.
Mnemonic : SANE.
Skin to skin touch (maintains body temperature).
Ambulatory support.
Nutritional support.
Emotional bonding.

Rooming in : Baby is kept very close to mother immediately after delivery.
Promotes breast feeding, reduces anxiety of mother.

Breast feeding

00:15:19

Advantages :

- Most nutritious for growth and development.
- Breast milk is very safe.
- Most economical.
- Most clean and hygienic.
- Promotes emotional bonding with the child.

Colostrum : Milk which is secreted in 0 – 3 days.
Rich in immunoglobulins Ig A > Ig G.
Mature milk : Complete diet for child, after 12 – 14 days of child.
Transitional milk : From 3 days to 2 weeks.

Fore milk : First milk, more watery quenches the thirst.
Hind milk : Subsequent milk, more fatty, provides the energy and satisfies the satiety.
Feeds : 2 hourly with burping, at least 6 – 8 times per day.

Artificial feeds

00:21:02

Principal of artificial feeding :

Energy : 100 Kcal/kg/day, relates to diluted milk

approximately 150 ml of milk/kg/day.

- Proteins : 2 g/kg/day (~ 13 – 15 g/day).
- Carbohydrates : 10 g/kg/day.
- Undiluted milk after 4 months.
  Cow's milk has 3 times more protein & is given as 1 : 3 dilution.
- Feed : 6 – 8 times/day.

Evaluation/ legislation :

BFHI : Baby Friendly Hospital Initiative.

Started by UNICEF, has 10 points.

MAA : Mother's Absolute Affection.

1. Normal vaginal delivery, breast feeding given in < 1 hour.
2. Caesarean section, breast feeding given in < 4 hours.
3. Exclusive breast feeding for 6 months (prevents infection).

IMS ACT :

Infant milk substitutes, feeding bottles and infant food regulation act.

Started in 1992, later amended in 2000 & 2004.

Prohibition for publicity / advertisements of infant feeding / milk substitutes.

Active space

60c6b3eeaa8ded0e4e7e5ea7

PREVENTIVE PAEDIATRICS : GROWTH AND DEVELOPMENT

Indicators

00:00:54

Weight :

- Average birth weight is 2.8 Kgs to 3 Kgs.
- Doubles in 5 – 6 months.
- Triples in 1 year.
- Quadruples in 2 years.

Height/ length :

- At birth is approximately 50cms.
- Increases by 25 cms by 1st year.
- Increases by 12 cms by 2nd year.
- Increases by 9 cms by 3rd year.
- Increases by 7 cms by 4th year.
- Increases by 6 cms by 5th year.

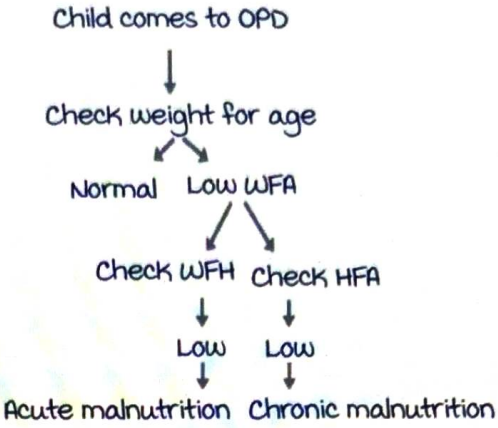
Indicators	Acute Diarrhoea	Chronic diseases (eg : malabsorption syndrome)
Weight for age (WFA)	Decreases	Decreases
Weight for height (WFH)	Decreases	Appears normal
Height for age (HFA)	same	Decreases

Weight for height is a specific marker for acute malnutrition.
Height for age is a specific marker for chronic malnutrition.
Weight for age is a general marker/most sensitive marker for malnutrition.

Weight for age : Gomez classification.
< 80% of expected WFA : Low on Gomez.

Height for age & weight for height : Waterlow's classification
< -2SD : Low on Waterlow's for both.

Active space



Low height for age : Stunting/chronic malnutrition.
Low weight for height : Wasting/acute malnutrition.
Low weight for age : Undernutrition.

Protein energy malnutrition :

Kwashiorkor : severe protein deficiency. Edema present.
Weight for age appears to be normal.
In case of edema, Welcome trust classification is used.
Marasmus : severe energy depletion.

Malnutrition

00:16:18

Low WFA, Low WFH, Low HFA.
Combined malnutrition (low WFH, HFA) :
It is called acute on chronic malnutrition.

60c6b3eeaa8ded0e4e7e5ea7

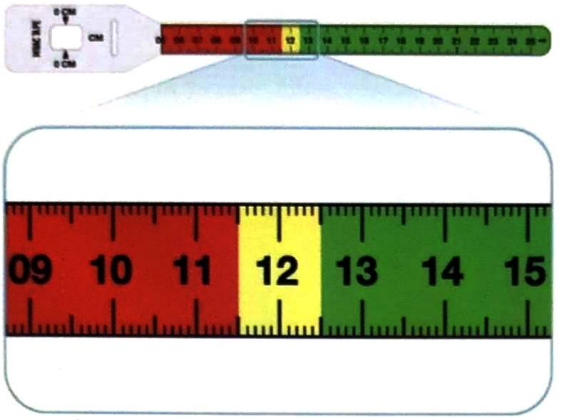
Salter's scale :
used especially in children who cannot stand by themselves.
weight is showed in 100 gms graduation (sensitivity of scale)

Active space

mid - upper arm circumference (MUAC) :

Color	Measurements	Indication
Red	<11.5 cm	Severe Acute Mainutrition (SAM)
Yellow	11.5 to 12.5 cm	Under-nourished
Green	> 12.5 cm	Normal

Mid-upper arm circumference (MUAC) tape



- MUAC is a sensitive indicator (triceps is the 1st muscle to lose or gain weight along with child's growth)
- Age independent.
- Used only after 6 months of age.
- Checks the girth of mid upper arm (midway between acromian and olecranon)
- measured using Shakir's tape.

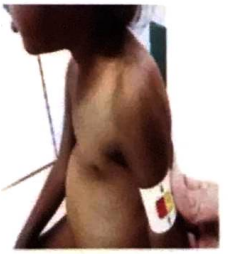
SAM (Severe acute malnutrition) child :

Diagnostic criteria : if >6 months of age

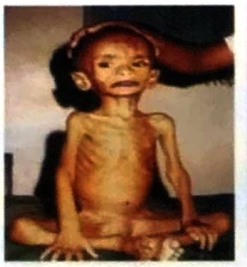
- MUAC is < 11.5 cm and/or
- Visible severe wasting and/or
- Low WFH < -3 SD and/or
- B/L pitting pedal edema.

Diagnostic criteria : if <6 months of age

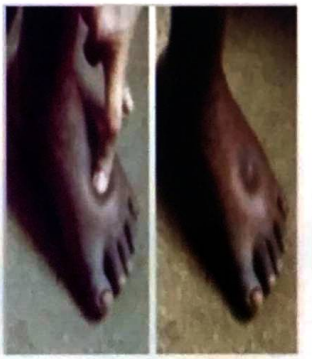
- Low WFH < -3 SD and/or
- Visible severe wasting and/or
- B/L pitting pedal edema.



MUAC measurement using Shakir's tape



Visible severe wasting



Pitting pedal edema

Active space

6 – 7 % of children with malnutrition develop SAM, they are admitted to NRC.

Nutritional rehabilitation center (NRC) 00:25:15

Phase 1 (stabilization phase) :
Lasts for 1 – 2 days, starter diet : F 75 diet is given.
75 Kcal, protein : 0.9 gms per 100 ml.
Iron not given (may lead to cardiac overload).

Phase 2 (transition phase) :
Lasts for 2 – 3 days, catchup diet : F 100 is given.
100 Kcal, protein : 3.9 gms per 100 ml.

Phase 3 (maintenance phase) :
Home based nutritious diet is given.
When child can finish > 90% of feed that is given, can be transitioned to maintenance diet.

Stabilzation phase 1 – 2 days	Stabilization in in-patient facility.	Promotes recovery of normal metabolic function and nutrition electrolytic balance.	Starter Diet : F – 75 diet. Constituents per 1000 ml 1. Cow's milk/toned dairy milk 300ml. 2. Sugar 100 gm. 3. Vegetable oil 20gms. 4. Add water to make 1000 ml. This provides 75 Kcal and 0.9 gm protein per 100 ml of F75.

Active space

Transition phase 2 – 3 days	Switch to transition phase when : • At least the beginning of loss of edema. • Return of appetite, • No NG tube infusions, no severe medical problems, • child is alert & reactive.	To ensure that the child is clinically stable and can tolerate an increased energy and protein intake.	Catch – up diet : F – 100 diet Constituents Per 1000 mL) 1. Cow's milk/toned dairy milk 900ml. 2. Sugar 75 gm. 3. Vegetable oil 20gm. 4. Add water to make 1000 ml. Nutrient value (per 100 gm) : Energy 100 Kcal, Protein 2.9 g, Lactose 4.2 g.

Rehabilitation phase (appetite recovered and non – medical problem)	• She/ he has reasonable appetite; finishes > 90% of the feed that is given, without a significant pause. • Major reduction or loss of edema. • No other medical problem.	To promote rapid weight gain, stimulate emotional and physical development and prepare the child for normal feeding at home.	Home based safe, hygienic, healthy, balanced diet.

Active space

Micronutrient supplementation

00:31:29

Age	Vit A dose
< 6 months	50,000 IU
6 – 12 months, weight <8 kg	1 lac IU
> 12 months, weight >8 kg	2 Lac IU

Multivitamin supplements	Twice the RDA
Folic acid	5 mg on day 1, then 1 mg / day
Elemental zinc	2 mg / kg / day
Copper	0.3 mg / kg / day
Iron	3 mg / kg / day (preferable in – between meals) After 2 days of 'catch – up' diet. Iron is not given in phase 1.

Growth charts

00:34:25

Was devised by David Morley.

It is commonly used to measure weight for age.

Growth charts are available for other indicators as well.

ICDS (Integrated Child Development Services) growth chart :

- They are based on MGRS (multi centric Growth Reference Standard).
- 50th percentile is considered as the upper limit.
- Green zone : Between 50th percentile & -2 SD.
- Yellow zone : Between -2 SD to -3 SD.
  Mild to moderate malnutrition. At risk children.
- Red zone : Below -3 SD. Severe malnutrition.
- White area : Over nutrition.

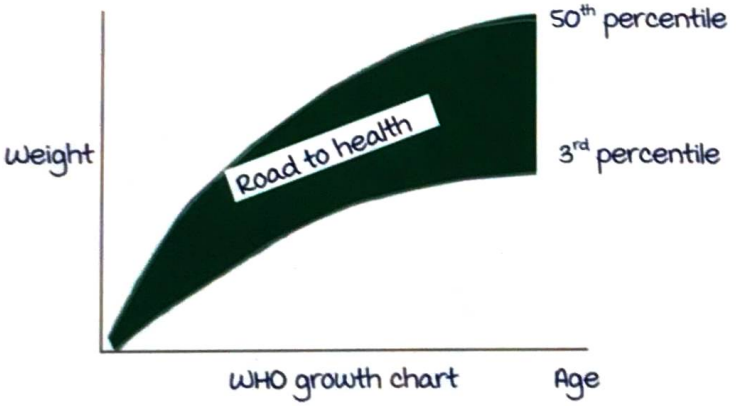
Active space

ICDS growth chart

WHO growth chart/ Harvard standards :

Formulated by Harvard University.

- Drawn for weight for age.
- Also called road to health growth chart /Boston health chart/field growth chart.
- Upper curve : 50th percentile,
- Lower curve : 3rd percentile,
- Green zone/ Road to health : Between 50th percentile and 3rd percentile
- Below 3rd percentile is undernutrition.



Advantages of growth chart :

- Tool for action.
- Tool for health education.
- Tool for growth monitoring : Most important feature to monitor is the trend of growth (increase/ decrease/ flat).

Active space

Important NFHS 5 data

00:49:29

1. Children under age 3 years breastfed within one hour of birth : 41.8%
2. Children under age 6 months exclusively breastfed : 63.7%
3. Children under 5 years who are underweight (weight for age) : 32.1%
4. Children and 5 years who are stunted (height for age) : 35.5%

5. children under 5 years who are wasted (weight for height) : 19.3%
6. Children aged 6-59 months who are anaemic (<11 g/dl) : 67.1%

India - Key Indicators

Indicators	NFHS-5 (2019-21)			NFHS-4 (2015-16)
Child Feeding Practices and Nutritional Status of Children	**Urban**	**Rural**	**Total**	**Total**
75. Children under age 3 years breastfed within one hour of birth[15] (%)	44.7	40.7	41.8	41.6
76. Children under age 6 months exclusively breastfed[16] (%)	59.6	65.1	63.7	54.9
77. Children age 6-8 months receiving solid or semi-solid food and breastmilk[16] (%)	52.0	43.9	45.9	42.7
78. Breastfeeding children age 6-23 months receiving an adequate diet[16, 17] (%)	11.8	10.8	11.1	8.7
79. Non-breastfeeding children age 6-23 months receiving an adequate diet[16, 17] (%)	14.2	12.0	12.7	14.3
80. Total children age 6-23 months receiving an adequate diet[16, 17] (%)	12.3	11.0	11.3	9.6
81. Children under 5 years who are stunted (height-for-age)[18] (%)	30.1	37.3	35.5	38.4
82. Children under 5 years who are wasted (weight-for-height)[19] (%)	18.5	19.5	19.3	21.0
83. Children under 5 years who are severely wasted (weight-for-height)[19] (%)	7.6	7.7	7.7	7.5
84. Children under 5 years who are underweight (weight-for-age)[18] (%)	27.3	33.8	32.1	35.8
85. Children under 5 years who are overweight (weight-for-height)[20] (%)	4.2	3.2	3.4	2.1

Anaemia among Children and Adults				
92. Children age 6-59 months who are anaemic (<11.0 g/dl)[22] (%)	64.2	68.3	67.1	58.6
93. Non-pregnant women age 15-49 years who are anaemic (<12.0 g/dl)[22] (%)	54.1	58.7	57.2	53.2
94. Pregnant women age 15-49 years who are anaemic (<11.0 g/dl)[22] (%)	45.7	54.3	52.2	50.4
95. All women age 15-49 years who are anaemic[22] (%)	53.8	58.5	57.0	53.1
96. All women age 15-19 years who are anaemic[22] (%)	56.5	60.2	59.1	54.1
97. Men age 15-49 years who are anaemic (<13.0 g/dl)[22] (%)	20.4	27.4	25.0	22.7
98. Men age 15-19 years who are anaemic (<13.0 g/dl)[22] (%)	25.0	33.9	31.1	29.2

Active space

SOCIAL PAEDIATRICS

Child health problems

00:01:00

Anemia : 67% of children in India (major problem).
Breastfeeding started within 1 hour : 42% of children.
Exclusively breastfed children in India : 64%.
Fully immunized children in India : 76%.
Under nutrition (low weight for age) : 32% of children.
Stunting : 36%.
Wasting : 20%.

Child rights in the Constitution of India :

Article 24 : No child can be employed whose age is <14years.
Ministry of labour safeguards this article.
Article 39 : Children of tender age (14 – 19yrs) if employed, should be provided with,

- Appropriate work for age and work environment.
- One casual leave every 15 days.
- No night duties.
- Should not work with hazardous chemicals.

Article 45 : Right to free [illegible] education.

Child handicap :
It is a social/ public health phenomenon.
Disability is the loss of action/ work.
Physical handicap : Loss of function of organs.
Mental handicap :
IQ < 70 : Mental retardation.
50 – 70 : Mild mental retardation.
35 – 50 : Moderate mental retardation.
20 – 35 : Severe mental retardation.
< 20 : Profound mental retardation.

Child support organizations :

Orphanage :
Social organisation for children who have lost their parents/ abandoned by parents. Children stay and study

Active space

in orphanages. They can leave the organization once they are >18 years old.

Foster homes :

Children who have lost their parents, now live with distant relatives or any friends or any family members. No legal obligation/ inheritance between relatives or friends & the children.

Adoption :

Child gets a new home with legal binding.

Brostal :

Strict hostel for children >16yrs who are not socially adjustable.
These are residential schools with high levels of discipline.
Children are educated here.

Remand homes :

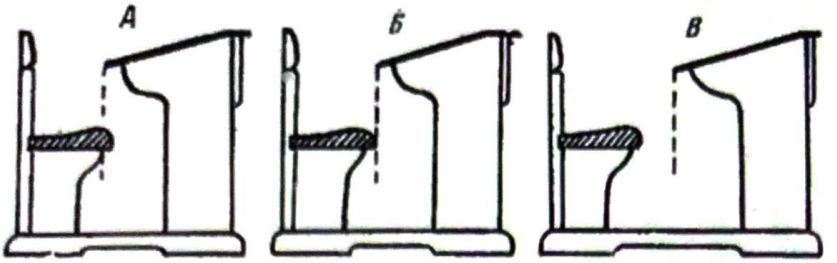
Juvenile homes are a part of punishment to crime.
There will be a medical doctor and psychiatrist apart from others to monitor the physical & metal health of children.

School health services (SHS)

00:10:32

Started in 1909.
Works under district administration of MOHFW.
Also under the Department of Education.
Medical officer in PHC/ CHC is incharge of SHS.
Elements of SHS :

- Space required for a
  Primary school → 5 acre land.
  Senior secondary school → 10 acre land + 1 acre/100 children.
- Should always have a neat playground in/ near the school.
- Outer walls should be minimum 10 inches thick.
- Smoking should be prohibited within 100 m of school.
- Each class should have a maximum of 40 students.
- Each student should get >10 sq ft area for sitting.
- Desk should be minus type with more than 30% legs under the desk.



- Windows should be >2.5 feet above the ground.
- Doors and windows together should be >25% of floor area.
- Each ventilator should be >2% of floor area.
- Walls should be white in colour.
- Light source should be from the left side.
- Canteen should always be present in case of >250 students. School approved vendors should be allowed if canteen facility is not available.
- 1 latrine for every 100 students.
  1 urinal for 60 students.
  Different for boys and girls.
- Medical checkups to be done by doctor and teachers.
  Mental health can be assessed by teachers.

Vitamin A screening :
Teachers can assess for night blindness.
Doctors can look for bitot's spots (epidemiological marker for Vit A deficiency in the community).
Dental caries screening to be done by the doctor.
And screen for any other infectious diseases.

Focus of SHS :

- Health care : Skin, eyes, mental and dental health care.
- To provide health education.
- Nutritional education regarding balanced diet and nutritional supplementation using Government schemes.
- To maintain school health records including immunization status of children.

Active space

RMNCH + A : PART - 1

Precursor of RCH (Reproductive Child Health) program is CSSM (Child Survival and Safe motherhood program).

RCH - 1 (phase I) (started on 15th October 1997) : Integration of mother and child health for the 1st time and to reduce neonatal deaths.

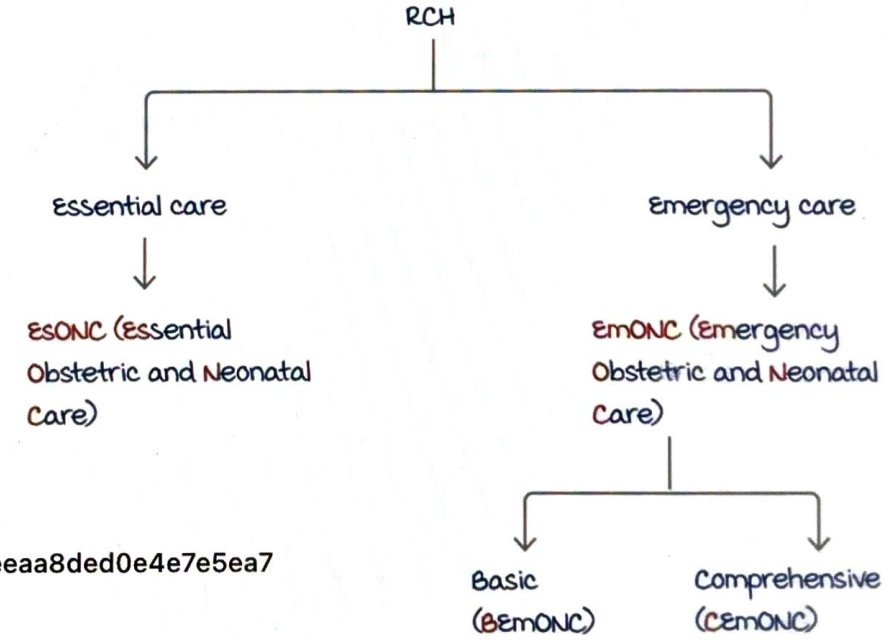
↓

RCH - 2 started with NRHM (2005) : Strengthened mother and child health, family planning services, immunization & child care services.

↓

RMNCH + A (2013)

Approach in RCH program :



ESONC : Provides essential antenatal care, neonatal care, postnatal care, intranatal care.

BEmONC :

- To have clean and safe delivery.
- Delivery huts and FRU's help in implementing BEmONC.

Delivery Hut 00:06:30

- At Village/community level.
- Provisions : OT table, Disposable Delivery Kit (DDK), Newborn Care Corner (NCC).
- NCC has basic emergency resuscitation kits.
- Function : Clean and safe delivery, obstetric and neonatal care.
- ASHA is incharge and so better reporting (as every delivery is notified by ASHA) of birth weight & issual of the mother & Child Protection (MCP) card.
- ASHA helps in birth level immunization (BCG, OPV, Hep B birth dose).
- ASHA can conduct delivery only if properly trained. But generally, they do not conduct deliveries.

First Referral Unit (FRU) 60c6b3eeaa8ded0e4e7e5ea7 00:13:03

- Upgraded CHC : CHC (obstetrician + anaesthetist + pediatrician) + Blood bank (24X7) services.
- Minimum bed strength : 20 – 30.
- Functional OT.
- Fully functional labour room.
- Newborn care in labour room.
- Functional laboratory.
- Blood storage facility (24X7).
- 24 hour water supply, electricity supply.
- Arrangement for waste disposal.
- Ambulance facility.

RMNCH+A/RCH 00:15:46

R : Reproductive care.
M : Maternal care.
N : Neonatal care.
C : Child care.
H : Health.
A : Adolescent.

- It is a life package for females in India.
- 5 components. Each component has 5 sub components. Hence, it is also called as 5 X 5 matrix program with a total of 25 components.
- Focus of the program : Adolescents.

Janani Suraksha Yojna (JSY)

00:20:38

kumarankitindia1@gmail.com

- Objective : To promote institutional deliveries.
- Janani : mother/ reproductive female.
- Strategy : Incentive based service.

	Rural	Urban	
Low performing states	1400/600	1000/400	All females
High performing states	700/600	600/400	BPL

EAG (Empowered action group) states : Bihar, MP, Maharashtra, Rajasthan, Uttarakhand, Chattisgarh, Odisha, Jharkhand, UP (Menomonic : BiMaRU COJU).

- Rural : 700/1400 + 600 (ASHA)
- Urban : 600/1000 + 400 (ASHA)

Janani Shishu Suraksha Karyakram/JSSK

00:24:19

Objective : To promote public health facility utilization.
Strategy : Free (OPD, IPD, treatment, lab investigations, diet & transport).
Beneficiaries : All sick pregnant and lactating females + children aged < 1 year.

Home Based Newborn Care (HBNC)

00:27:35

ASHA gives newborn care for immediate newborn.

- 6 visits by ASHA : Day 3, 7, 14, 21, 28, 42.

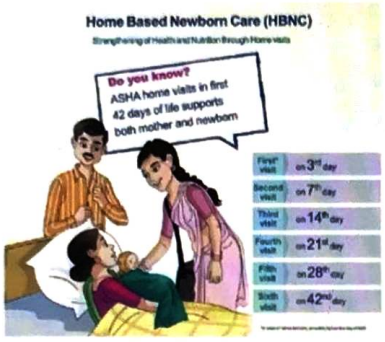
Active space

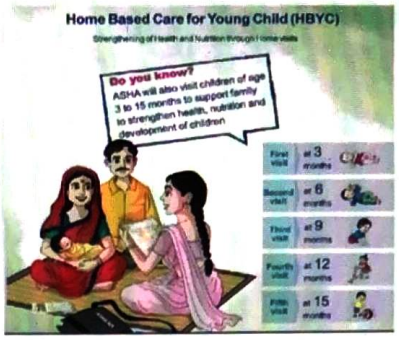
Cesarean section : 5 Visits : Day 7, 14, 21, 28, 42.

Home based delivery : 7 Visits : Day 1, 3, 7, 14, 21, 28, 42.

Objective : ASHA promotes breastfeeding, health care + body weight measurement of the child.

If child is alive till 42 days, ASHA gets Rs. 250/child on 45th day.





Home Based care for Young Child (HBYC) 00:27:35

- New program, launched only in few states.
- ASHA visits children of age 3–15 months.
- 5 visits: 3rd, 6th, 9th, 12th, 15th month.
- ASHA gets incentive of Rs. 250/child.

Facility Based Neonatal Care(FBNC) 00:33:32

60c6b3eeaa8ded0e4e7e5ea7

3 levels :

- Special Newborn Care Unit (SNCU).
- Newborn Stabilization Unit (NBSU).
- Newborn Care Corner (NCC).

NCC :

- Available at all delivery points.
- Basic resuscitation kits will be there.
- Present within the labour room.

NBSU :

- From PHC level onwards (doctor should be available).
- Advanced resuscitation materials will be available.
- Present adjacent to the labour room.

SNCU :

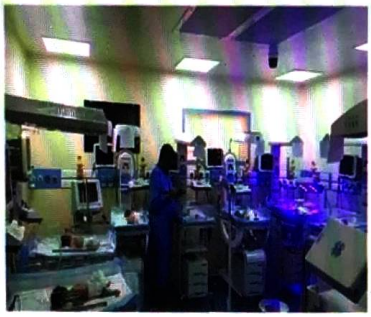
- Available at district hospitals.
- They are away from the labour room.
- 10 – 12 beds (> 100 sq.ft/bed).

Active space

- 24X7 doctor + nurse facility.
- > 3000 deliveries/year.

SNCU admission criteria :

- Very low birth weight < 1800 gm.
- Cyanosis of the baby.
- Severe anemia/pallor, bleeding, severe jaundice of the baby.
- Hypothermia (temperature <36.4°C)
- Convulsions.
- Major congenital anomalies.



Neonates with the above said conditions are upgraded to SNCU from NBSU. After, symptoms resolve, they will then be downgraded to lower levels of care.

Rashtriya Bal Swasthya Karyakram (RBSK) 00:39:36

- For 0 – 18 years children.
- Objectives : Screening for 4D's : Diseases, Developmental delays, congenital Defects, Deficiencies.

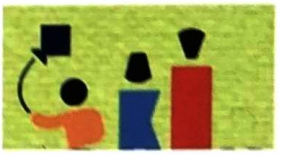
Defects	Developmental delays
1. Neural tube defect	15. Vision impairment
2. Down's syndrome	16. Hearing impairment
3. Cleft lip & palate/cleft palate alone	17. Neuro-motor impairment
4. Talipes (club foot)	18. Motor delay
5. Developmental dysplasia of the hip	19. Cognitive delay
6. Congenital cataract	20. Language delay
7. Congenital deafness	21. Behaviour disorder (autism)
8. Congenital heart diseases	22. Learning disorder
9. Retinopathy of prematurity	23. Attention deficit hyperactivity disorder

Active space

Deficiencies	Diseases of childhood
10. Anemia especially severe anemia (iron) 11. Vitamin A deficiency (bitot spots) 12. Vitamin D deficiency, (rickets) 13. Severe acute malnutrition 14. Goiter (Iodine)	24. Skin conditions (scabies, fungal infections & eczema) 25. Otitis media 26. Rheumatic heart disease 27. Reactive airway disease 28. Dental conditions 29. Convulsive disorders

Rashtriya Kishore Swasthya Karyakram 00:41:48

- For adolescent girls and boys (10 – 19 years).
- Objective : Healthy adolescents.



- Strategy :
  1. To open Clinics → Counselling → Content → Communication → Convergence → health Care → to the Community (7 C's).
  2. It has 'Saathiya scheme' : Peer to peer approach.
  3. Iron & folic acid (IFA) supplementation under Anemia Mukt Bharat (AMB) Scheme.

Adolescent Reproductive and Sexual Health (ARSH) 00:45:16

- Objective : Healthy adolescents (mainly girls).
- Strategy : To open ARSH clinics.
  1. ARSH clinic provides WIFS (Weekly Iron Folic acid Supplementation) under AMB.
  2. Menstrual hygiene.
  3. Counselling regarding family planning, healthy family life, healthy birth, etc.
- New name for ARSH clinic : AFHC (Adolescent Friendly Health Clinic).

Integrated Management of Neonatal and Childhood Illness (IMNCI) 00:48:26

60c6b3eeaa8ded0e4e7e5ea7

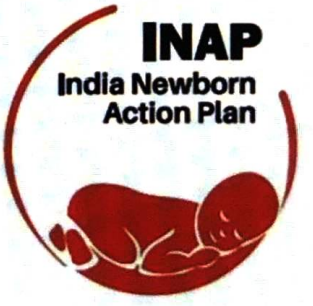
- WHO launched IMCI (Integrated management of Childhood Illness)
- In India, neonatal component is integrated with IMCI.
- Integration is for adequacy of man power (human resource).
- Any frontline worker (ASHA, AWW, teachers, lab technician, MPW, ANM) can help in treating children with malaria, typhoid, pneumonia, diarrhoea etc.,
- Strategy : LACT (Look, Assess, Classify & Treat).
  IMNCI booklet given. Table made for every disease. One disease in each page. One divided into 3 categories.

First/top category	Pink	First aid + urgent referral.
Second/middle category	Yellow	Treat the child + follow up.
Third/last category	Green	Reassurance + home based management + health education.

India Newborn Action Plan/INAP 00:54:09

Target :

- Single digit Still Birth Rate (SBR) & single digit Neonatal mortality Rate (NMR) in India (< 10) by 2030.
- While under SDG, neonatal mortality rate should be < 12 by 2030.

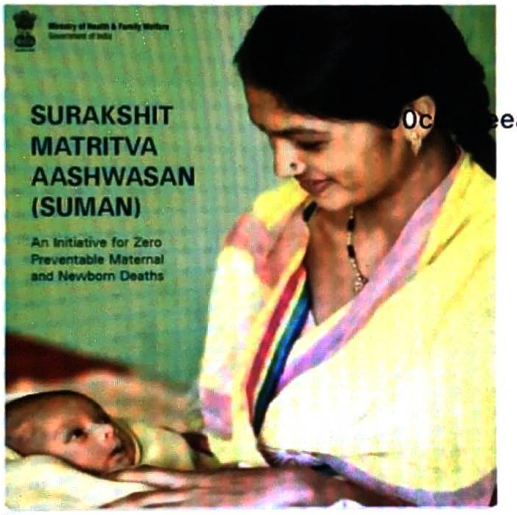


RMNCH +A : PART - 2

Suman 00:00:40

Surakshit Matritva Aashwasan :

- Free ANC, delivery and post natal care.
- Free treatment for sick new neonates.
- Free transport and zero expense delivery.
- No tolerance to denial.
- It will ensure respectful care with privacy and dignity, with early initiation and support for breastfeeding, zero dose vaccination and free and zero expense services for sick newborns and neonates.



eaa8ded0e4e7e5ea7

Components :

- Ambulance services.
- Minimum 4 ANC.
- Delivery mechanisms.
- Healthcare for pregnant and lactating females.
- Care with dignity.
- Grievance redressal.

Pradhan Mantri Surakshit Matritva Abhiyan 00:03:19

It involves screening in ANC for high risk pregnancy.
Free ANC clinic is conducted on 9th day of every month at PMSMA impaneled hospital facilities.

Active space

They classify pregnancies into different categories :

Category	Color code
No risk factor	Green sticker
High risk pregnancies	Red sticker
Comorbidities like diabetes, hypothyroidism etc.	Yellow sticker
Pregnancy Induced Hypertension	Blue sticker

Pradhan Mantri Matru Vandana Yojana 00:06:36

For the 1st child of the family. Centrally sponsored scheme.
Incentive based service acceptance.

- Early registration within 12 weeks (1000 INR).
- Institutional Delivery (2000 INR).
- Registration of child and completion of 1st dose of vaccination (2000 INR).

This is apart from JSY incentive.

Labor Room Quality Improvement Initiative (LAQSHYA) :

LAQSHYA लक्ष्य

Active space

Focuses on : Good services.
Good quality and hygienic devices / instruments.

Nutritional Rehabilitation Centre 00:10:35

Criteria for admission :

- MUAC < 115 mm with or without any grade of edema.
- WFH < -3 SD with or without any grade of edema.
- Bilateral pitting edema +/++ (children with edema +++ always need inpatient care).

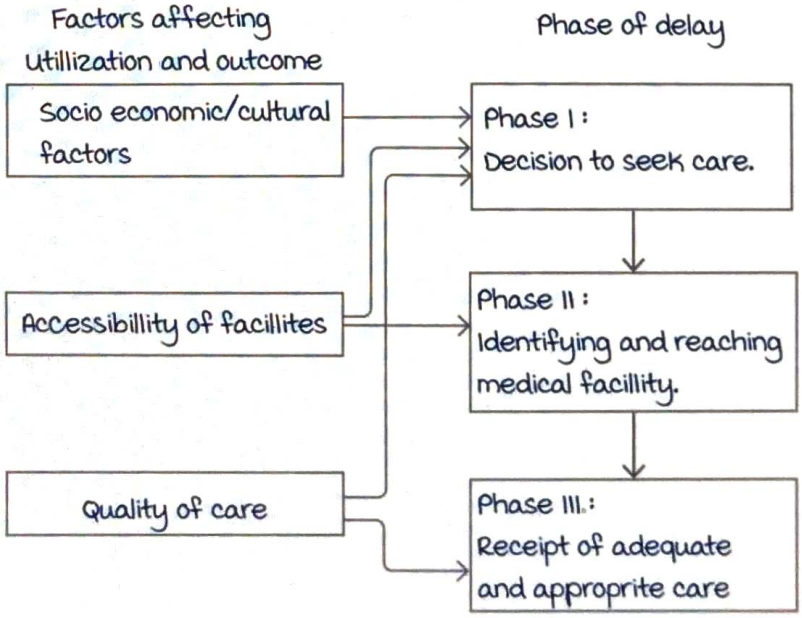
With

- Anorexia (loss of appetite) , fever (39 °C) or hypothermia (< 35 °C).
- Persistent vomiting or severe dehydration, hypoglycaemia, severe anemia, severe pneumonia.
- Not alert, very weak, apathetic, unconscious, convulsions or any other.

Starter diet (F 75) and catch up diet (F 100) are given to these patients at the centers.

Vandematram scheme : Launched in Delhi, Haryana & other northern states.
Yashodha scheme : Launched in Telangana, Andhra pradesh.
Mamta scheme : Started in Gujarat, Rajasthan.
Aim of all these schemes is to provide better obstetric care.

The three delays' model



Organization of MCH care

00:16:14

	Health care facility	Basic function
Level I : Basic Centres	Subcentre B, Non 24 X 7 PHCs.	Normal vaginal deliveries, Newbron care corner, newborn stabilization unit (NBSU).
Level 2	PHC, CHC, Non FRU CHCs.	Deliveries, basic emergency obstetic neonatal care, NBSU, sick children; HIV, HEP B females.
Level 3 : Specialised centres	FRU, DH, Sub-district hospitals.	Comprehensive emergency obstetric neonatal care, complicated deliveries.

	Beds	Criteria	Human resource
Level I	2 to 6	> 3 normal vaginal deliveries / month	2 ANM + other staff.
Level 2	6 to 30	> 10 deliveries / month	2 - 3 MO, 4 staff nurses 2 LT + other staff.
Level 3	> 30	> 20 deliveries / month	2 - 4 MO, O & G, Anesthesia, Peds, other staff.

Indicators for survey based scorecard

00:22:20

Mortality : • Under five mortality rate. • Infant mortality rate. • Neonatal mortality rate. • Maternal mortality ratio. (per 100,000 live births)	Diarrhoea : • Oral rehydration therapy, or increased fluids for diarrhoea (among children < 2 years of age who had diarrhoea in preceding 2 weeks).
Fertility : • Total fertility rate. • Births to women during age 15 – 19 out of total births.	Pneumonia : • Care seeking for ARI in any health facility (among children < 2 years of age who had ARI in preceding 2 weeks).
Nutrition : • Children with birth weight < 2 – 5 Kg. • Children under 3 years who are underweight.	Service delivery : • Woman who received 4 + ANC. • Skilled birth attendance (delivery by doctor, ANM/ nurse/LHV). • Mother who received postnatal care from a doctor/nurse/ LHV/ANM/other health personnel within 2 days of delivery for their last birth (%). • Early initiation of breastfeeding (< 1 hr). • Exclusive breastfeeding for 6 month (among 6 – 9 months children).
Gender cutting : • Child sex ratio 0 – 6.	
Cross cutting : • Full immunization children (12 – 23 months) receving 1 dose BCG, 3 doses of pentavalent/OPV/ 1 dose IPV each & 2 measles vaccine. • Household having access to toilet facility. • Couple using spacing method for > 6 months.	

mortality, nutrition, fertility indicators	Category
< 20% of national average	Green
20% above and below the national average	Yellow
> 20% of national average	Red

Other indicators	Category
> 20% of National average	Green
20% above and below the National average	Yellow
< 20% of National average	Red

Active space

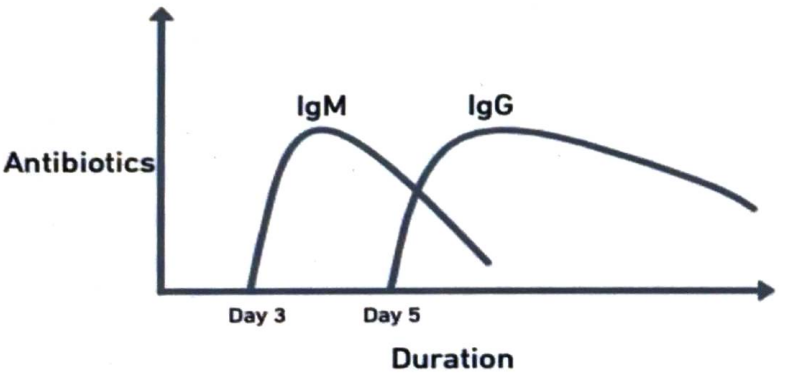
IMMUNIZATION BASICS

To get vaccinated is the right of every child.
Active immunity : Development of antibodies after an infection or vaccination.
Passive immunity : Immunity from readymade antibodies.

Active immunity

Primary immune response : First exposure to antigen → IgM antibodies are produced initially (3 – 7 days) → IgG antibodies are produced subsequently (after 2 – 10 days).
First antibody to be formed is IgM.
IgG antibodies are more in number and stay for a longer time.
Body is sensitized to antigen leading to training of reticuloendothelial system and formation of memory T cells.

Secondary immune response : Repeated exposure to same antigen → rapid antibody response → antibodies are produced in large numbers.
This is the reason for giving multiple doses of vaccines.



Humoral response : Formation of immunoglobulins by B cells.
T-cell mediated immune response is also called as Cell mediated immunity.

Humoral and T-cell mediated immune response work in conjunction to produce immunity against antigens.

Immunoglobulins :

IgM :

- ~6% of total immunoglobulins.
- 1st antibody to appear.
- Half life is around 7 days.

IgG :

- 80% of total immunoglobulins.
- Develops subsequently after IgM.
- Maternal transfer of antibodies via placenta.
- Half life is around 21 days.

IgA :

- ~13% of total immunoglobulins.
- More in body secretions.
- Colostrum is rich in IgA.

- Half life is around 7 days.

IgE and IgD :

- Less than 1 - 2% of total immunoglobulins.
- IgE is responsible for allergic reactions.

Passive immunity

00:11:04

- There is no training of reticuloendothelial system and formation of memory T cells.
- Rapid/immediate immunity development.
- Temporary immunity (short half life of immunglobulins)
- Induction : Human immune globulins and non-human immune globulins (antisera).
  Immune globulin nomenclature is used because they are from external sources and to differentiate from naturally made immunoglobulins.

Indications for human immune globulins :

Disease	Dosage
Hep A	0.02 - 0.05 ml/kg bw
Hep B	0.05 ml/kg bw
Hep C	0.05 ml/kg bw
Rubella	20 ml

Varicella zoster	15 – 25 units/kg bw
measles	0.25 ml/kg bw
Rabies	20 IU/kg bw
Tetanus	250 units

- Hepatitis A : To those who travel to endemic areas.
- Hepatitis B : Post-exposure prophylaxis (needle stick injury), newborns born to Hepatitis B positive mother.
- Hepatitis C : Post – exposure prophylaxis (needle stick injury), newborns born to Hepatitis C positive mother.
- Rubella : Exposure during early pregnancy (to avoid Congential rubella syndrome).
- Varicella Zoster : To all newborns exposed to the virus, immunocompromised children.
- Measles : To all newborns exposed to viruses, immunocompromised children.
- Rabies : Class 3 bites in general population, class 2 and class 3 bites in immunocompromised individuals.
- Tetanus : Unclean wounds & unimmunized. Given as intramuscular injection. Effect lasts for 3–4 weeks.

Indications for non-human immune globulins (antisera) :

Disease	Dosage
Diphtheria	500 – 1000 IU as IM
Tetanus	1500 units equine ATS as IM
Rabies	40 IU /kg equine ARS
Botulism	10,000 units polyvalent antitoxin
Gas Gangrene	10,000 IU as IM, polyvalent antitoxin

- Diphtheria antisera : Close contacts of severe diphtheria cases.
- Rabies : Human immune globulin is used in India. It is better than equine immune globulin.
- Tetanus : Human immune globulin is preferred.
- Botulism and gas gangrene: Antisera is available.

Types of vaccines

00:19:28

- Live vaccines.
- Killed vaccines.
- Subunit vaccines.

Live vaccines :

Serial cultures are done to retain immunogenicity & is called Attenuation. Organism can multiply.

Produces immune response much more than a Killed vaccine.

No virulence (do not cause disease).

Killed vaccines :

Organism is Killed using chemicals.

Most commonly used chemical is formalin.

Produces lesser immune response.

No multiplicative capacity.

Subunit vaccines : Synthetically manufactured vaccines.

Live vaccines :

Mnemonic : BOY Love CRIME Types.

BCG.

OPV.

Yellow fever.

Live vaccines

Chicken pox.

Rubella.

Influenza.

Measles, Mumps.

Encephalitis (JE).

Typhoid.

Live vaccines are contraindicated in severe immunocompromised state/pregnancy/allergies.

Killed vaccines :

- Organisms cannot multiply.
- Genome of organism is not injected.

Active space

- Less efficacious. 2 or more doses of vaccine are required.
- Not contraindicated in immunocompromised.
- Contraindicated in case of untoward effect of vaccine/ anaphylaxis.
- Example : Japanese encephalitis (Nakayama, Beijing strain), pertussis.

Subunit vaccines 00:25:50

Toxoids, protein vaccines, polysaccharide vaccines, Glyco-conjugate vaccines and recombinant vaccines are the types of subunit vaccines.

1. Toxoids :
Exotoxin produced by bacteria is injected.
Example : Diphtheria, Tetanus.

2. Protein vaccine :
Prepared from protein subunit of the organism.
Example : Influenza, acellular pertussis vaccine, Novavax (covid vaccine from spike protein).

3. Polysaccharide vaccine :
Prepared from outer capsular polysaccharide of the organism. It should be serotype specific. Cannot be given to children < 2 years (significant immune response is not seen).
Example : Hib vaccine, Typhoid, Pneumococcal vaccine.

4. Glyco-conjugate vaccine :
Polysaccharide is conjugated with protein molecule. Should be serotype specific.
Advantage : Increased immunity induction. Beneficial in children < 2 years.
Example: Pneumococcal (PCV), meningococcal (A,C,W_{135},Y).

Active space

5. Recombinant vaccine :
Antigen is cultured on yeast/host and amplified. Example : meningococcal, HPV, cholera toxin vaccine (Dukoral, Shanchol).

Mixed vaccines :
Combination of different vaccines. Example : DPT, DTaP.
Pentavalent vaccine : DPT + H. influenzae B + Hepatitis B.

Freeze dried vaccine :
Vaccine in powder form.
They should be reconstituted with diluents such as normal saline, distilled water, buffers etc.
Disadvantage : Risk of contamination most commonly by Staphylococcus aureus. Should be used on the same day after reconstitution.
Example : BCG, measles, Japanese encephalitis.
BCG and measles should be used within 4–6 hours after reconstitution. Japanese encephalitis should be used within 2 hours after reconstitution.

Vaccine constituents 00:37:19

1. Adjuvants :
Immuno boosters : Increase the potency of vaccine.
Example : AS 01 (malaria vaccine), AS 03 and AF 03 (Influenza vaccine), AS 04 (HPV, Hep B vaccine), alum/aluminium hydroxide (pentavalent vaccine, DPT, pneumococcal conjugate vaccine).

2. Excipients :
Inert substances : Do not have any immunological effect.
Added at the manufacturing level.

3. Stabilizers :
Proteins that stabilize the vaccine by preventing chemical reactions and precipitation. They do not stick to vaccine vial walls. Proteins (albumin, gelatin and globulin) are usually used as stabilizers.

4. Preservatives :

Increase the shelf life of the vaccine.

Example : Thiomersal (no longer used), phenol, phenoxyethanol (most commonly used).

5. Buffers :

Inhibits the action of pH on vaccine.

Maintain the osmolarity of the vaccine in different pH conditions.

Example :

Gastric buffer in cholera vaccine (Dukoral vaccine) prevents destruction of subunit B toxin by gastric pH.

Phosphate buffer to prevent destruction of Japanese encephalitis vaccine (SA 14-14-2) by blood pH.

Most commonly used buffer is sodium chloride.

6. Diluents :

Used for freeze dried vaccines to convert powder formulations to liquid.

Examples :

Measles vaccine : Distilled water.

BCG vaccine : Normal saline.

Japanese encephalitis vaccine : Phosphate buffer.

7. Emulsifiers :

Stabilize the vaccine by decreasing the surface tension.

Example :

Polysorbate, Tween 80.

Purified protein derivative (PPD) with Tween 80 is used in tuberculin test.

8. Antibiotics :

- Neomycin : Varicella, MMR, Inactivated polio vaccine.
- Gentamycin : Influenza vaccine.
- Erythromycin : Used previously in measles vaccine/ measles rubella vaccine.
- Streptomycin + Neomycin : Inactivated polio vaccine.

Neomycin allergy is a contraindication for MMR, IPV vaccine.

NATIONAL IMMUNIZATION SCHEDULE

Expanded Program For Immunization (EPI) in 1974.
Universal Child Immunization Program (UIP/UCIP) in 1985.
Pulse Polio Immunization (PPI) in 1992.
Mission Indradhanush in 2014.
Intensified Mission Indradhanush (IMI) in 2017. Currently, version 4.0 is being followed since Feb 2022.

- EIP & UIP deals with 6 Vaccine Preventable Diseases (VPD) :
  Diphtheria, Pertussis, Tetanus, Polio, Measles, Tuberculosis.
- PPI promotes herd immunity.
- Indradhanush means rainbow (7 colours). Mission Indradhanush – 7 VPDs : Diphtheria, Pertussis, Tetanus, Polio, Measles, Tuberculosis & Hepatitis-B.
  Objective : > 90% coverage (> 7 visits of child till 5years).
- Intensified Mission Indradhanush : Promotes immunization coverage. District based approach with 3 rounds of immunization.
  Goal : > 90% coverage across India (currently 70% coverage).
  Districts involved : 413 districts.

Intensified Mission Indradhanush

Active space

National immunization schedule 00:06:21

Visits :

At birth, 6, 10, 14 weeks, 9 months, 16 to 24 months,

5 to 6 years, 10 to 16 years.

Number of visits under 16 years of age is 8.

Under 5 years : 7 visits

Total number of visits : 8 for children + 1 for pregnant female (to get Td in pregnancy) = 9 visits.

12 VPDs are tackled under the IMI programme :

1. Tuberculosis (BCG).
2. Polio (OPV).
3. Hepatitis B.
4. Diphtheria.
5. Pertussis.
6. Tetanus.
7. Haemophilus influenzae B (for meningitis, pneumonia).
8. Rotavirus.

60c6b3eeaa8ded0e4e7e5ea7

9. Pneumococcal diseases (Pneumococcal conjugate vaccine).
10. Measles.
11. Rubella.
12. Japanese Encephalitis is only in selected districts.

Age	National Immunization schedule
At Birth	BCG + OPV (0 dose) + Hep B vaccine (Birth dose)
6, 10, 14 weeks	PV (1, 2, 3) + OPV (1, 2, 3) + RVV (1, 2, 3) + fIPV (at 6 weeks & 14 weeks) + PCV (at 6 weeks & 14 weeks)
9 months	MR 1 + Vit A + PCV booster + JE 1 (endemic)
16 to 24 months	MR 2 + OPV booster + DPT booster + JE 2 (endemic)
5 to 6 years	DPT booster
10 to 16 years	Td

OPV : Oral Polio Vaccine (live vaccine).

PV : Pentavalent vaccine.

RVV : Rotavirus vaccine.

fIPV : fractional dose of Inactivated Polio Vaccine (Killed).

Active space

PCV : Pneumococcal Conjugate Vaccine.

MR : Measles Rubella.

DPT : Diphtheria Pertussis Tetanus vaccine.

JE : Japanese Encephalitis Vaccine.

Td : Tetanus & low dose Diphtheria Toxoid vaccine.

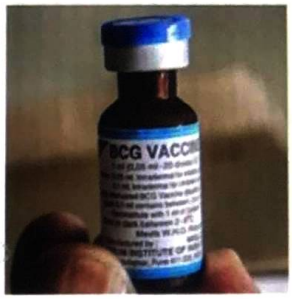
5 Live vaccines : BCG, OPV, RVV, MR, JE.

Birth vaccines

00:15:45

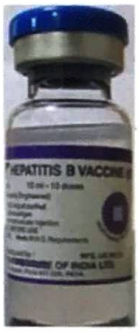
BCG vaccine :

- Amber bottle as it is sensitive to heat & light.
- Dose : 0.1 ml intradermally in the left upper arm.
- Dose at birth : 0.05 ml till one month of age (to prevent skin rupture in Indian babies).
- Prevents childhood Tuberculosis.
- Maximum age : Till 1 year of age.



OPV vaccine (0 dose) :

- Dose : 5 drops.
- Maximum age for 0 dose : 15 days.



Hep B birth dose :

- Prevents mother to child transmission of Hepatitis B.
- Maximum age : within 24 hours.

	Type	Dose	Route	Site	Maximum age	Side effects
BCG	Live	0.1ml	ID	Left upper arm	1 year	Lymphadenitis (1 month - 1 year)
Hep B	Recombinant vaccine	0.5ml	IM	Anterolateral aspect of left thigh	24 hours	No (anaphylaxis sometimes).
OPV	Live	5drops	oral	-	Birth : 5days Child: 5years	VAPP
Pentavalent	mixed	0.5ml	IM	Anterolateral aspect of left thigh	1 year	Pertussis (killed) : neurological deficits.

Active space

Rota virus	Live	5drops /2.5ml	oral	-	1 year	Intussusception
fIPV	Killed	0.1ml	ID	Right upper arm	1 year	-
PCV	Conjugate	0.5ml	Im	Anterolateral aspect of right thigh	1 year	-
measles/ MR	Live	0.5ml	s/c	Right upper arm	5 years	measles like illness.
DPT	Mixed	0.5ml	Im	Anterolateral aspect of left thigh	7 years	Killed pertussis : neurological deficits.
JE	Live	0.5ml	s/c	Left upper arm	15 years	-
Td	Mixed toxoid	0.5ml	Im	Deltoid	-	Brachial neuritis

Side effects of BCG vaccine : Lymphadenitis (Seen even after one month till one year of vaccination).
Most common is fever, scar formation.

Birth dose of OPV : Only upto 15 days of birth.
OPV in child : Till 5 years.
VAPP : Vaccine Associated Paralytic Polio.

Pentavalent vaccine :

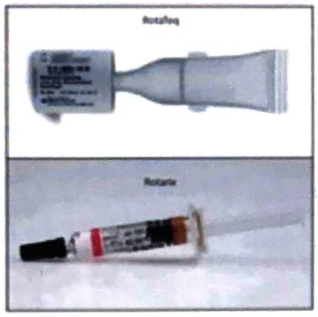
- Mixed vaccine.
- Contains Diphtheria + Pertussis + Tetanus + H. influenza B + Hepatitis B.
- 0.5 ml intramuscularly in antero lateral aspect of left thigh.
- Pertussis is a killed vaccine. It causes neurological deficits that might be the reason for inconsolable cry (> 3 hours)
- Contraindicated in Epilepsy/convulsions, progressive neurological deficits.
- In the cases where DPT is contraindicated, DTaP can be given (Diphtheria, Tetanus, acellular Pertussis : protein subunit vaccine).
- Pentavalent vaccine must be started before 1 year of age.

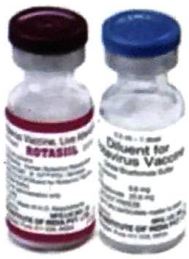
Rotavirus vaccine

00:30:21

- Rotavac, Rotasil, Rotateq, Rotarix.
- Oral vaccine.
- Rotavac : Oral – 5 drops.
- Rotasil : Oral – 2.5ml.

Rotavirus Vaccine (Live Attenuated)





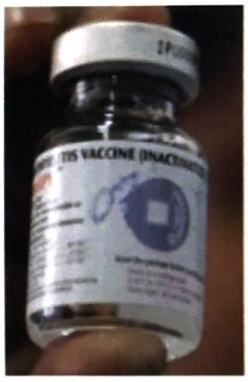
Rotavac > Rotasil are used in many places in India.

60c6b3eeaa8ded0e4e7e5ea7

IPV (Inactivated Polio Vaccine) :

According to WHO,

- SALK : Killed vaccine.
- 6, 10, 14 weeks (anytime with a gap of 4 weeks).
- 0.5 ml intramuscularly.



Inactivated Polio Vaccine

fIPV (fractional dose of Inactivated Polio Vaccine) :

According to Government of India,

- 0.1 ml intradermally.
- 6 weeks, 14 weeks (gap of 8 weeks to enhance immune response).

PCV (Pneumococcal Conjugate Vaccine) :

- Expensive (Rs 800/vaccine for procurement)
- Now given in all states and union territories.
- In India PCV 13 (13 serotypes) is given.
- 2 primary doses (gap of 8 weeks) + 1 booster dose.

Active space

MR vaccine

00:40:13

- Measles Rubella vaccine : Live vaccine.
- 0.5 ml subcutaneously in the posterior aspect of right upper arm.
- 2 doses.
- For MR vaccine second dose, there was a campaign. It is called Catch up → Keep up → Follow up.
- Catch up : All children > 9 months & < 10 years were given extra dose of MR vaccine.
- Side effects :
  Most common : Fever with measles like illness (rash).
  Self limiting side effect.
  Rarely : SSPE (Subacute Sclerosing Pan Encephalitis).

JE vaccine :

- Live vaccine.
- Strain : SA 14-14-2.
- Only in JE endemic districts.
- 2 doses : 9 months, 16 to 24months of age (gap of > 3 months).
- In unimmunised children, can be given till 15 years.
- In adults : 2 doses with a gap of 3 months (not a part of NIS).

Td vaccine :

- Earlier TT was given, now Td is preferred.
  In TD : Tetanus = 2- 10 LF, Diphtheria = 6-25 LF
  (LF: Limits of Flocculation). In Td (d) : Less dose (< 2 LF).
- To children between 10 to 16 years.
- All pregnant females : 2 doses of Td.
- If female had received complete immunization within 3 years : Single dose of Td to prevent hyperimmunization. Mid-long term side effect : Brachial neuritis.

Active space

Oral : • OPV • Rotavirus vaccine.	
Right upper arm : • measles (MR) • fIPV	Left upper arm : • BCG • JE
Anterolateral aspect of right thigh : • PCV	Anterolateral aspect of left thigh : • Pentavalent. • Hep. B vaccine. • DPT

Unimmunised child

00:53:59

- Priority vaccine at 9 months : MR vaccine.
- Always mind the gap.
  Example :
  measles/MR : gap of 4 weeks.
  PCV : gap of 8 weeks.
  JE : gap of 3 months.
  DPT (primary doses) : gap of 4 weeks.
  DPT (booster dose) : gap of > 6 months from last dose.
  OPV (booster dose) : gap of > 12 months from last dose.
- There is a maximum age for each vaccine. There is a package system for every vaccine.

UIP schedule after introduction of Td vaccine

Age	Vaccination schedule after Td introduction
At birth	BCG, OPV : zero dose, Hep B : birth dose
6 weeks	OPV 1, Pentavalent 1, Rota 1, fIPV 1, PCV 1
10 weeks	OPV 2, Pentavalent 2, Rota 2
14 weeks	OPV 3, Pentavalent 3, Rota 3, fIPV 2, PCV 2
9 months	measles 1/MR 1, Vit A, JE 1, PCV B
16–24 months	DPT first booster dose, OPV – booster dose, measles 2/MR 2, JE 2
5–6 years	DPT second booster dose
10 & 16 years	Td

For pregnant woman	Td 1 : Early in pregnancy Td 2 : 4 weeks after Td-1 Td B : If pregnancy occur within 3 years of last pregnancy and 2 Td doses were received

Active space

IMMUNISATION - FAQ

1. What if the child spits out the vaccine or vomits?

A. Repeat the oral dose.

2. What if vomiting persists ?

A. Refer the child to a higher centre.

3. Is there a sequence to be followed at 6, 10, 14 weeks/9 months?

Vaccines given at 6, 10, 14 weeks are OPV, Pentavalent, Rotavirus, fIPV, PCV.

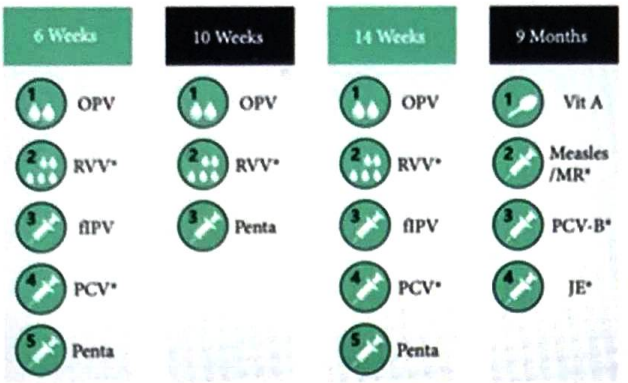
UIP schedule after introduction of Td vaccine

Age	Vaccination schedule after Td introduction
At birth	BCG, OPV-zero dose, Hep B-birth dose
6 weeks	OPV-1, Pentavalent-1, Rota-1*, fIPV-1, PCV-1*
10 weeks	OPV-2, Pentavalent-2, Rota-2*
14 weeks	OPV-3, Pentavalent-3, Rota-3*, fIPV-2, PCV-2*
9 months	Measles-1/MR-1, Vit A, JE-1*, PCV-B*
16-24 months	DPT first booster dose, OPV-booster dose, Measle MR-2, JE-2*
5-6 years	DPT second booster dose
10 & 16 years	Td
For pregnant woman	Td-1 : early in pregnancy Td-2 : 4 weeks after Td-1 Td-B: if pregnancy occur within 3 years of pregnancy and 2 Td doses were received

Active space

60c6b3eeaa8ded0e4e7e5ea7

A. Yes. A sequence has to be followed while giving these vaccines.



First will always be oral vaccines.
Oral polio → Rota virus → fIPV/PCV → Pentavalent.
Pentavalent is given at last because it causes inconsolable cry due to pertussis component.
At 9 months, Vit A → measles/MR → PCV-B → JE.

4. Shake test is done for which vaccines?

A. For all freeze sensitive vaccines like Hep-B, DPT, Td/TT and Pentavalent.

5. What is eVIN?

A. Electronic vaccine intelligence network.
A mobile app that helps in managing availability and stocks of vaccines in different parts of the country.

eVIN
ELECTRONIC VACCINE INTELLIGENCE NETWORK

60c6b3eeaa8ded0e4e7e5e87

6. If a child has received all doses of vaccine through routine immunization, will he/she still require additional doses during a campaign?

A. Yes. Campaign doses are always extra doses.
The child can receive extra dose provided a gap of 4 weeks is maintained between the extra dose and next scheduled immunization dose.

Active space

(eg. Child who is already vaccinated for MR-1 can receive the extra dose during campaign. MR-2 is given atleast 4 weeks after the extra dose).

Exception : If JE vaccine is given in a campaign, there is no need to repeat the vaccine in the National Immunization Schedule.

JE vaccine is expensive and is given only in certain endemic areas.

7. Why are sites specified for each vaccine?

A. For operational reasons and to maintain uniformity.

For example, to know if a child has received BCG vaccine, we check the left arm of the child.

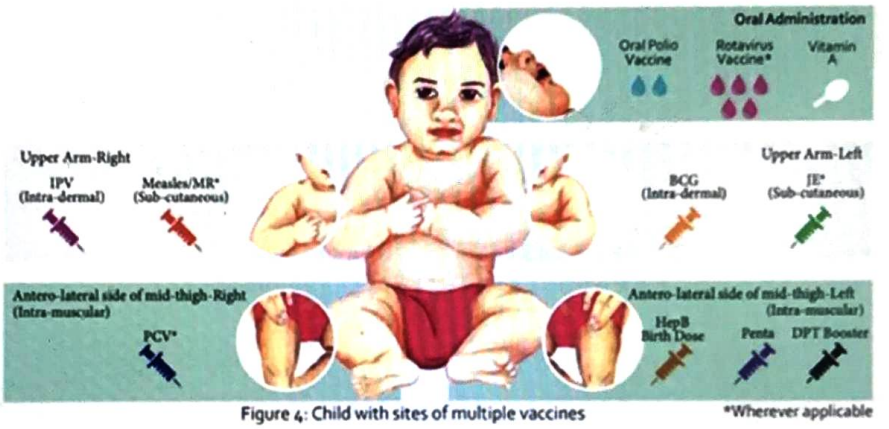


Figure 4: Child with sites of multiple vaccines

*Wherever applicable

8. Shouldn't we avoid vaccines in HIV positive cases?

A. We give all due vaccines to children with HIV/any immuncompromised state.

Live vaccines are avoided in case of :

- CD4 count < 15% of expected level.
- Absolute CD4 count < 200 cells.
- Symptomatic HIV.

In case of immunocompromised children, OPV can be postponed until CD4 count rises to expected level due to risk of developing VAPP (vaccine associated paralytic polio). Hence, OPV is given with caution.

9. Any specific conditions in which we should avoid some vaccines?

A. • Live vaccines are avoided in HIV/immunocompromised patients and pregnancy.

- Egg allergy : Avoid all vaccines except for Influenza and Yellow fever vaccines.
- Previous history of intussusception/abdominal surgeries/ intestinal malformations : Avoid rotavirus vaccine.
- Recent H/O convulsions/high grade fever : No vaccine to be given.
- Progressive neurological deficits : Avoid all Whole Cell pertussis component containing vaccines (DPT/PV/ Pertussis vaccine). Acellular component of pertussis vaccine is given.
- Streptomycin/Neomycin/Polymyxin-B allergy : Avoid IPV.
- Allergic reaction to a vaccine : Never repeat the dose.

10. What is the meaning of a fully immunised child?

A. A child who has taken all due vaccines till one year of age. As per UIP, the child would have taken the first dose of all the vaccines.

11. What is the meaning of a completely immunised child?

A. A child who has taken all due vaccines till 2 years of age.

12. What vaccines should be given to a 15 days old infant who has not been vaccinated?

A. BCG can be given upto 1 year of life.
OPV-0 is given to all children < 15 days old.
Birth dose of Hep B is given within 24 hours of life.
So, in this child we can give BCG + OPV-0.

13. What vaccines should be given to a 1 month old infant who has not been vaccinated?

A. BCG is the only vaccine that can be given to this infant.
- < 1 month : Dose is 0.05 ml ID in the left upper arm.
- > 1 month to < 1 year : Dose is 0.1 ml ID in the left upper arm.

14. What vaccines should be given to a 6 month old child who has received BCG, OPV-1 and Penta-1 only?

A. OPV-2 and Pentavalent-2 only.

Rotavirus vaccine, PCV & fIPV are given along with OPV-1 and Pentavalent-1 only as a package.

15. What vaccines should be given to a 8 month old child who has received OPV-1, RVV-1 and Penta-1 only?

A. BCG, OPV-2, RVV-2 & Pentavalent-2 can be given. PCV, fIPV cannot be given.

60c6b3eeaa8ded0e4e7e5ea7

16. What vaccines should be given to a 9 month old child who has received BCG, OPV-2, RVV-1, Penta-2, IPV-1 and PCV-1 only?

A. Give vaccines due for 9th month & continue further doses of already started vaccines. MR-1, JE-1 (if endemic) + OPV-3, RVV-2, Pentavalent-3, IPV-2 & PCV-2.
Priority/most important vaccine : MR-1 at 9 months of age (given in case parents deny multiple vaccines at one time).

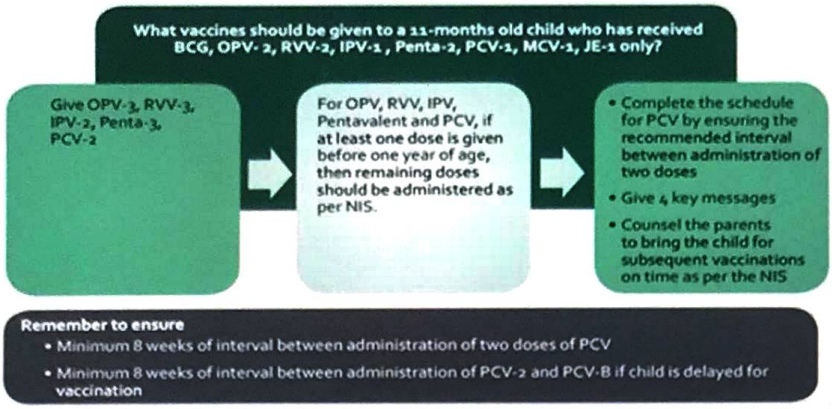
17. What vaccines should be given to a 10 month old child who has never been vaccinated?

A. Since the child is never vaccinated & age < 1 year : BCG + 6th week vaccines + 9th month vaccines can be given.
BCG + OPV-1, RVV-1, fIPV-1, Pentavalent-1, PCV-1 + MR-1, Vitamin A, JE-1 (if from an endemic area).
Priority/most important vaccine : MR-1 at 9 months of age

18. What vaccines should be given to a 11 month old child who has received BCG, OPV-2, RVV-2, IPV-1, Penta-2, PCV-1, MCV-1, JE-1 only?

A. OPV-3, RVV-3, IPV-2, Pentavalent-3, PCV-2. No MCV and JE as the child's already been vaccinated.
Minimum 8 weeks of interval between administration of 2 doses of PCV.
Minimum 8 weeks of interval between administration of PCV-2 & PCV-B if child is delayed for vaccination.
MCV means Measles Containing Vaccine.

Active space



4 Key messages :

1. Inform the family about the diseases for which vaccines are being given.
2. When is the next visit?
3. Where to come during the visit?
4. Bring the MCP (mother child protection) card.

19. What vaccines should be given to a 12 month old child who has never been vaccinated?

A. OPV-1, DPT-1, MR-1, JE-1 (if from an endemic area).
First dose of BCG, RVV, pentavalent, IPV & PCV are administered only before one year of age.
OPV can be given till 5 years of age as per UIP and if age is > 1 year, Pentavalent vaccine is replaced with DPT vaccine.

20. What vaccines should be given to a 14 month old child who has received BCG, OPV-1, IPV-1, Penta-1 only?

A. OPV-2, Pentavalent-2, MV/MR-1, JE-1 (if from an endemic area).
IPV-2 cannot be given now as it is given only with OPV-3 & Pentavalent-3 as a package.

21. What vaccines should be given to a 16 month old child who has never been vaccinated?

A. OPV-1, DPT-1, MV/MR-1, JE-1 (if from an endemic area) can be given.

Active space

22. What vaccines should be given to a 18 month old child who has received BCG, OPV-2, RVV-2, IPV-1, Penta-2, PCV-1 only?

A. OPV-3, RVV-3, Pentavalent-3, IPV-2, PCV-2, MR-1, JE-1 (if from an endemic area). MR vaccine can be given till 5 years of age.

23. What vaccines should be given to a 24 month old child who has never been vaccinated?

A. OPV-1, DPT-1, MCV-1, JE-1 (if from an endemic area).

24. What vaccines should be given to a 3 year old child who has received BCG, OPV-3, RVV-3, IPV-2, Penta-3, PCV-2?

60ceb3eeaa8ded0e4e7e5ea7

A. OPV-B, DPT-B, PCV-B, MR-1, JE-1 (if from an endemic area).

There should be 6 months to 1 year gap between booster dose and previous doses of OPV.

DPT : 6 months gap.

PCV-B : 8 weeks gap.

Last dose of any vaccine can be checked from the MCP card.

25. What vaccines should be given to a 5 year old child who has never been vaccinated?

A. JE-1 (if from an endemic area) , DPT-1.

DPT can be given upto 7 years.

JE-1 can be given upto 15 years.

measles vaccine cannot be given as it is administered only till 5 years of age.

Active space

COLD CHAIN

Cold chain is a mechanism to maintain the temperature of vaccines.
In peripheral areas where vaccines are used : +2 to +8°C.
Storage temperature of vaccines : – 15 to –25°C.

Reverse cold chain : Transportation of stool samples for AFP surveillance at +2 to +8°C.
Warm chain : Newborn temperature maintenance.

Components of cold chain

00:02:36

- Day carrier : Can carry 6 – 8 vaccine vials.
- Vaccine carrier : Can carry 16 – 20 vaccine vials.
- Cold Box : Can carry 25 – 30 vaccine vials.
- Ice lined refrigerators (ILR)
- Deep freezers
- Walk in Cold rooms (WICR)/ Walk in Freezers (WIF).

} Require electricity.

Day carriers : 2 types.

Standard vaccine carrier : Ice packs are openly placed in vaccine carrier without an insulated barrier lining to separate the vaccine storage compartment from the icepacks.
Disadvantage : Vaccine vials come in direct contact with the icepacks.

Freeze resistant vaccine carrier : An insulated barrier is present between icepack pockets and vaccine storage compartment.

Ice - lined refrigerator (ILR) 00:06:45

It can be opened from the top.
There are water channels on the walls of the ILR to keep it cool.
Temperature varies from +2 to +8°C.
Heat sensitive vaccines are placed at the bottom (coolest area).
Freeze sensitive vaccines are placed at the top (less cold).

Dial thermometer : measures the temperature of ILR.
+2 to +8°C is the green zone and arrow should always be in the green zone. It is placed in the middle of the ILR.
60c6b3eeaa8ded0e4e7e5ea7
Temperature is recorded atleast twice a day.

ILR is present at all immunization centres from PHC to district level hospitals.
Vaccines are not stored in an ILR.
ILR needs minimum 8 hours of electricity/ day to maintain the vaccine efficacy.

Active space

Deep freezers 00:12:39

- Available at the CHC or district hospital.
- Used only for manufacturing/ freezing the icepacks.
- Deep freezers are never used to store vaccines.

However, in certain situations like polio outbreak which would require polio immunization centres, OPV vaccines can be stored in a seperate deep freezer only at district level.

- Temperature in deep freezer : -15 to -25°C.

WICR/WIF :

Used only for storage at district/ state/ central levels.

Sensitivity of vaccines

00:14:58

Heat sensitive vaccines :

OPV, Measles vaccine, BCG, Rotavirus vaccine, JE vaccine.

Freeze sensitive vaccines :

Hep B, Pentavalent vaccine, PCV, DPT, IPV.

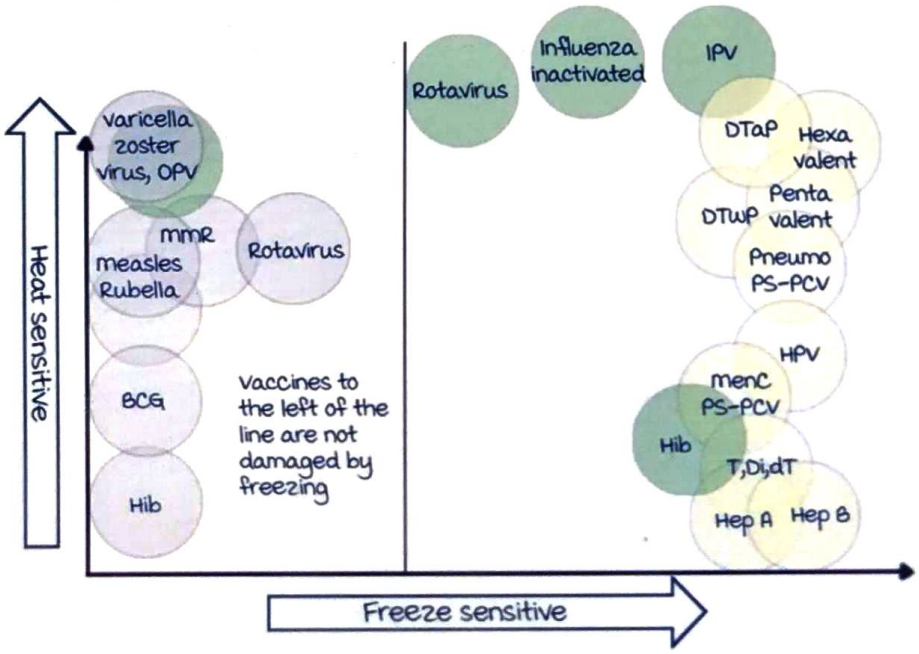
	Heat sensitivity	Light sensitivity
OPV (not freeze sensitive)	↑ ↑ ↑	-
mv/MR	↑ ↑	↑
BCG, RVV, JE	↑	↑ ↑ ↑

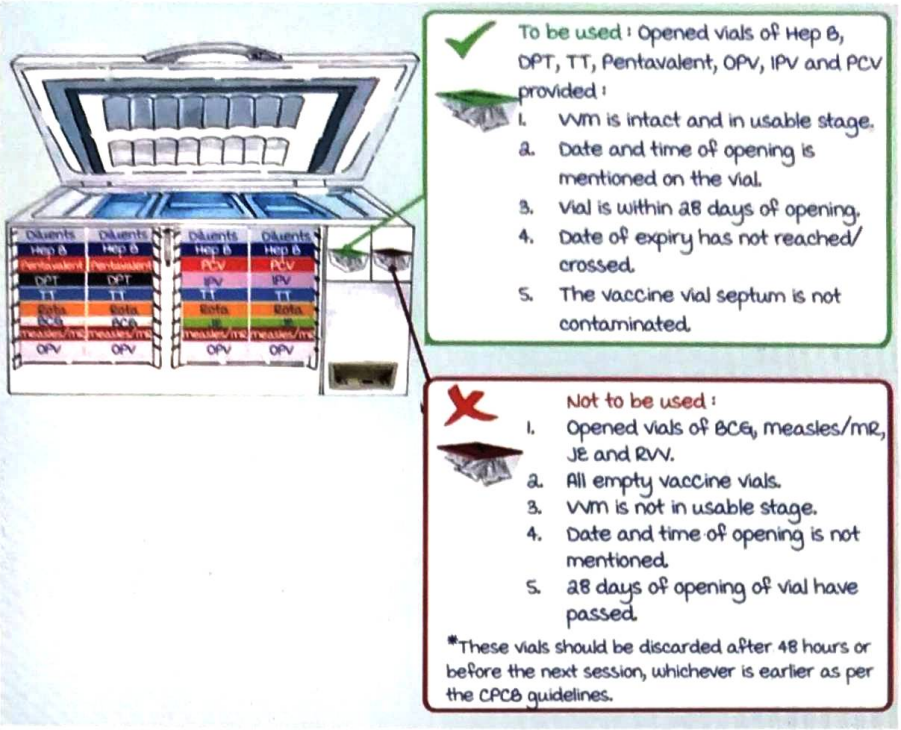
IPV is both heat and freeze sensitive.

Heat sensitivity : rBCG > OPV > measles.

Among vaccines in NIS, OPV is the most heat sensitive.

Freeze sensitivity : Hep B > Pentavalent > DPT/Td.



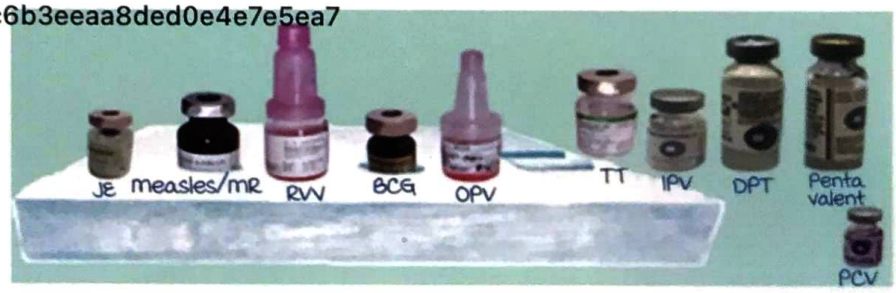


Polio vaccines, measles vaccine are stored at the bottom of an ILR (heat sensitive vaccines in coolest area).
Hep B, Pentavalent, Td/TT vaccines are stored in the top shelf of an ILR (freeze sensitive vaccines in less cold area).

Vaccines sensitive to heat		Vaccines sensitive to freezing	
• BCG (after reconstitution)	Most	• HepB	Most
• OPV		• PCV	
• IPV		• Penta	
• Measles, MR		• IPV	
• Rotavirus		• DPT	
• JE		• TT	
• DPT			
• BCG (before reconstitution)			
• TT,			
• Penta, HepB, PCV	Least		Least

Vaccines on ice pack : JE, measles/MR, RVV, BCG, OPV.
Never on ice pack : TT, IPV, DPT, Pentavalent, PCV.

60c6b3eeaa8ded0e4e7e5ea7



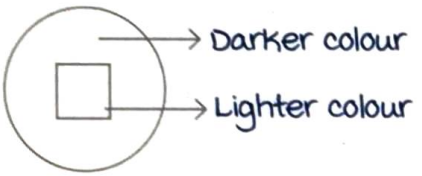
Active space

Vaccine vial monitor (VVM) 00:21:58

VVM is a chemical indicator of heat stability of the vaccines.
Chemical indicator : P – toluene sulfonate (PTS).

Types of VVM : VVM_2, VVM_7, VVM_{14}, VVM_{30}.

E.g : VVM_{14} – Vaccine will get spoiled after 14 days if the vaccine is kept at 37°C.



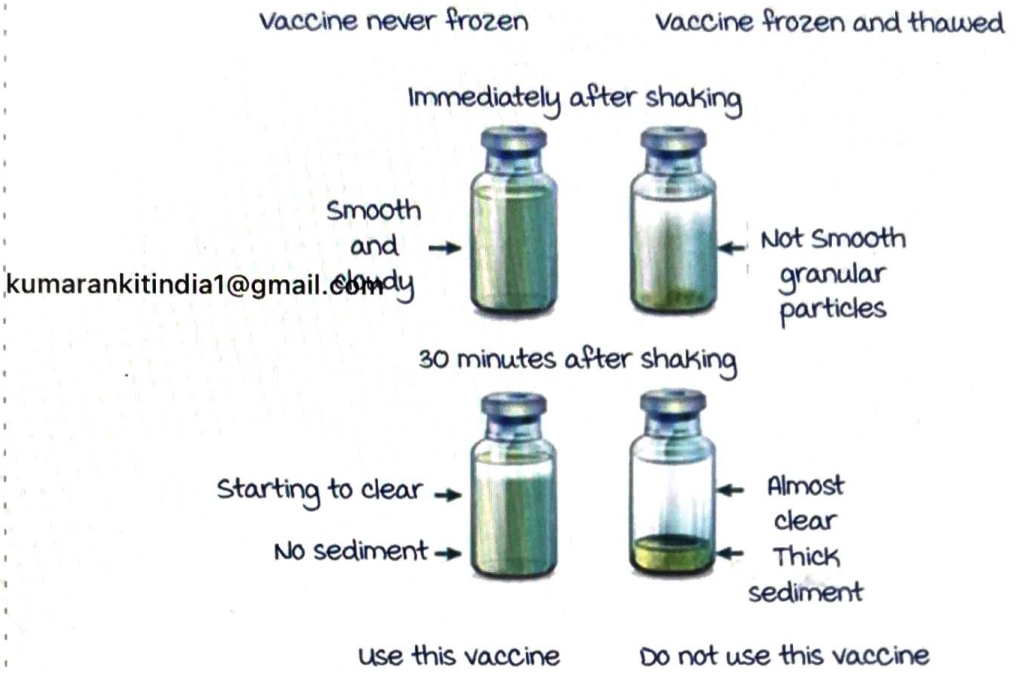
Color of the inner square becomes darker from lighter with time. Color of the circle will not change. 60c6b3eeaa8ded0e4e7e5ea7
Discard point : Vaccine is discarded when the Colour of square = Colour of circle.
If color of the square is darker than the circle, it is a non potent vaccine and should not be used.

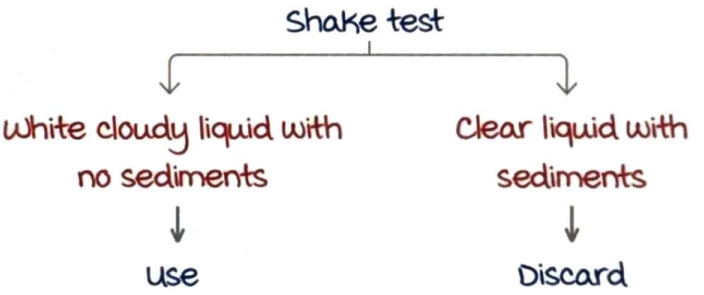
Importance of location of VVM :
If VVM is on the label : Vaccine can be reused after opening the vial.
If VVM is on the neck or cap of the vial : Vaccine cannot be reused.

Shake test 00:26:10

Shake test is used to identify unprecipitated vaccines.
Done for all freeze sensitive vaccines i.e. Hep B, PCV, DPT, Pentavalent & all tetanus toxoid containing vaccines.
All DPT vaccines contain an immunoboosting adjuvant : $Al(OH)_3$.

Upon freezing the vaccine, the adjuvant precipitates and gives rise to a non potent vaccine.
Hence, it is important to ensure that the adjuvant does not precipitate.





Always use a control vial (vial frozen and thawed to normal temperature).
Test vial → Shaken → Compared with control vial.
Sediment is precipitated aluminium hydroxide.

Open vial policy

00:30:21

All vaccines can be used till 28 days after opening except :

- Measles (within 4 – 6 hours)
- Rotavirus (within 4 – 6 hours)
- BCG (within 4 – 6 hours)
- JE (within 2 hours)

} To be used on the same day.

COVID 19 (6 – 8 hours of opening or within the same session).

Active space

These vaccines are freeze dried.
Using these vaccines again poses a risk of staphylococcal contamination.

In peripheral centres, vaccines should not be stored for more than 28 days.
In storage facilities (WICR/ WIF) at district level, vaccines should not be stored for more than 3 months.
Storage for > 3 months can be done at state/ national level.

VACCINE STRAINS, GVAP, MCP CARD

Strains and other approved vaccines 00:00:46

Yellow fever vaccine :

- Exotic disease in India.
- Vaccine required for people who travel to endemic areas.
- Live vaccine : 17 delta strain.
- Effect starts in 10 days and lasts for lifetime.
- Contraindications : Infants < 6 months and pregnancy.

Pregnant females are advised not to travel to Yellow fever endemic areas. However, if the travel is inevitable, yellow fever vaccine has to be taken before travel.

Vaccine strains :

- Measles : Edmonston Zagreb strain.
- Mumps : Most common strain is Jeryl Lynn.
- Rubella : RA 27/3 strain.
- BCG : Danish 1331 strain.
- Chicken pox : OKA strain.
- Typhoid vaccine :
  1. Oral typhi 21a : Live vaccine; Can only be given to people >5 years of age, used for travellers.
  2. Vi polysaccharide vaccine : Serotype specific, contraindicated in children < 2 years.

Emporiatrics is the science of travellers that deals with the prevention and management of health problems of travellers.

- Meningococcal vaccine :
  Quadrivalent vaccine : A, C, W – 135 and Y strain.
  Highest risk of anaphylaxis/hypersensitivity reactions.
- Pneumococcal vaccine :
  1. Pneumococcal conjugate vaccine : Useful in infants.

Active space

PCV-10/PCV-13 are given as 2 primary doses (6 weeks, 14 weeks) and 1 booster dose (9 months) by the Government of India. At least 8 weeks gap between 2 doses.

2. Pneumococcal polysaccharide vaccine : Contraindicated in children <2 years. Given for immunocompromised, people at risk of pneumococcal infection : Post splenectomy, transplant, long term steroid therapy.

- Cholera vaccine :
  1. Dukoral vaccine : Whole cell cholera toxin (B subunit toxin). Oral formulation. Given with gastric buffer to prevent destruction of B subunit toxin by gastric pH.
  2. Shanchol vaccine and Euvichol vaccine : No need for gastric buffer as there is no B subunit toxin.

60c6b3eeaa8ded0e4e7e5ea7

- Dengue vaccine :
  CYD-TDV vaccine : Tetravalent dengue vaccine (Dengvaxia). It is a viral vectored vaccine.

- Malaria vaccine :
  Circumsporozoite protein vaccine (CSV – protein vaccine) : Mosquirix contains 3 components RTS-S/ASO1
  R – Repeat segment of circumsporozoite protien (CSP).
  T – T cell epitome of CSP. S – HBsAg. ASO1 – Adjuvant.
  Approved for trials in Africa.

- Polio vaccine :
  1. Oral vaccine : Live vaccine (Sabin). Produces local immunity + humoral immunity. Useful in epidemics. Contains 2 strains → P1 and P3. Time difference between each primary dose is 4 weeks. Time difference between primary and booster doses is 6 months to 1 year.
  2. Injectable vaccine : Killed/inactivated (Salk). Produces only humoral immunity. Not useful during

Active space

epidemics. In India, fractional component of inactivated polio vaccine is used. It is given at 6 weeks and 14 weeks. Contains all 3 strains.

- Japanese encephalitis vaccine :
  1. Live vaccine : SA 14-14-2 strain. It is used in India. Given in 2 doses at 9 months and 16-24 months in endemic areas. Dose is 0.5 ml subcutaneous in left upper arm. In case of unimmunized children, it is applicable to be given till 15 years.
  2. Killed vaccine : Nakayama strain/Beijing strain.

- Leprosy vaccine :
  Strain is Mycobacterium Indicus Pranii vaccine. Also called as MW vaccine. If MW vaccine is given along with multidrug therapy (MDT), it is known as immunotherapy.

- AIDS vaccine :
  1. Vaccines are under clinical trials.
  2. rAAV vaccine : Recombinant adeno associated virus vaccine.
  3. Ankara vaccine.

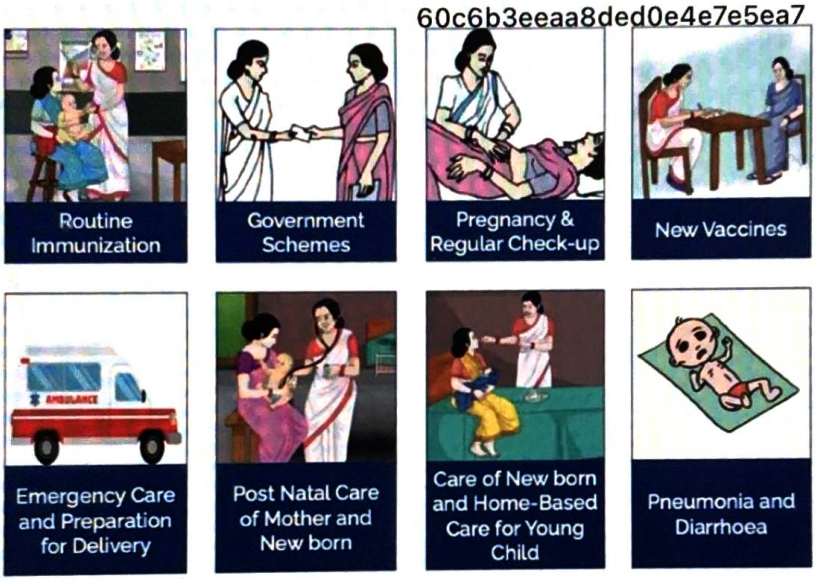
- COVID-19 vaccines :
  1. mRNA vaccines : Pfizer, Moderna.
  2. Viral vector vaccines :
     Astra Zeneca (Covishield) : uses CHAD-OX-1 strain (Chimpanzee adeno virus : Oxford strain).
     Sputnik vaccine : Produced by Gamaleya institute. Contains modified replication defective adenovirus (MRD-adenovirus).
     Other viral vector vaccines : Yellow fever, Dengue vaccine.
  3. Killed vaccine : Covaxin, Sinovac.
  4. Protein subunit vaccine (spike protein) : Novavax (Novavax by COVAX is used under GAVI : Global Alliance for Vaccine Initiative, Voluntary contribution of vaccines to poor countries.
  5. Receptor domain binding vaccine (RDB) : Corbevax.

Global vaccine action plan 2011-2020 00:26:20

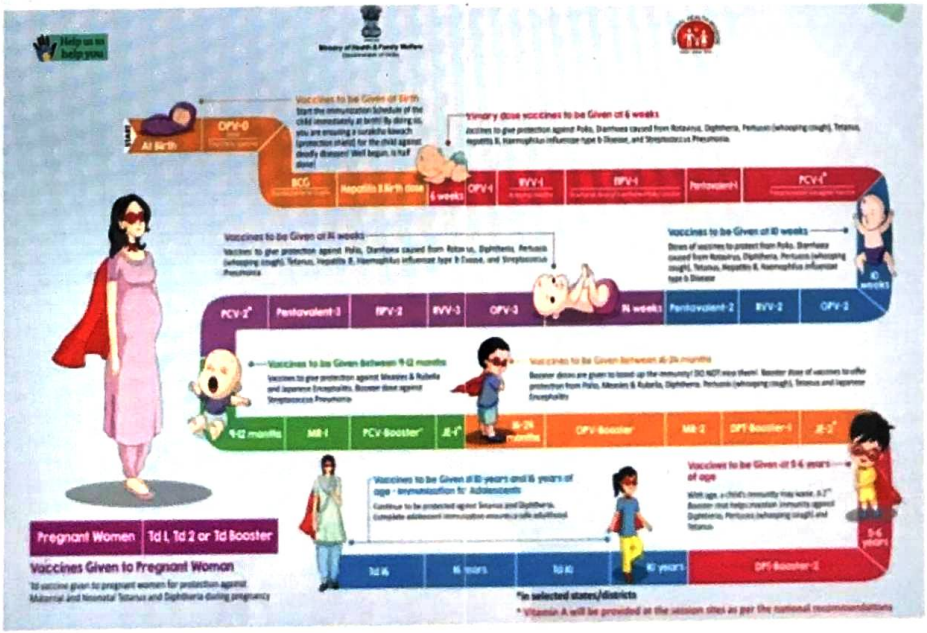
- Under 5 mortality reduction >2/3rd.
- Polio eradication.
- Measles, Rubella elimination and neonatal Tetanus elimination in >2 WHO regions.
- Immunization coverage > 90% (100% ideally) in all WHO regions across the world.

New initiatives in government of India :

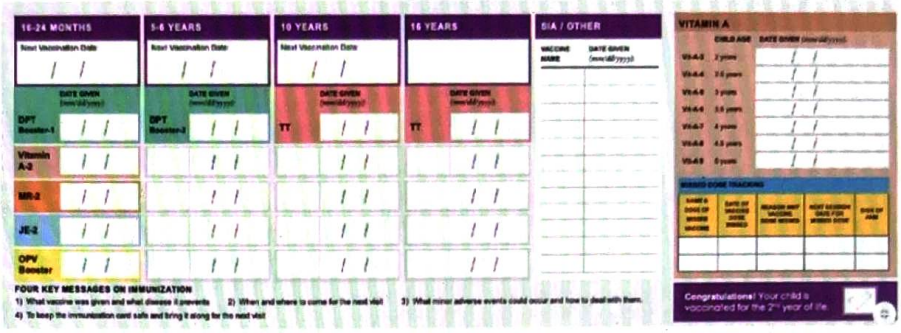
1. Mother and child protection card (MCP) :



mcp card provides the above information



Active space



2. Mother and child tracking system (MCTS):

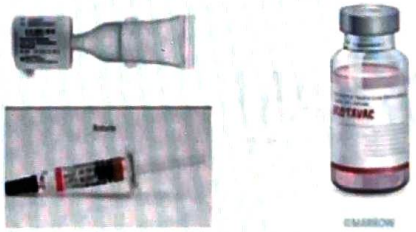
A unique number (single numeric number : same for mother & child) is generated using online software to track status of mother and child.

Kilkari app:

To promote growth and development of child as well as immunization.

Difference between rotavirus vaccines:

Rotavirus vaccine (Live Attenuated)



Rotavac vaccine : Dose is 5 drops.

Active space

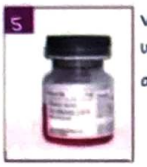
Steps in administration of Rotavirus vaccine

Vaccine Vial & dropper

Pull out the aluminum seal along the indicated mark

Tear off as shown to remove aluminum seal

Tear off as shown to remove aluminum seal

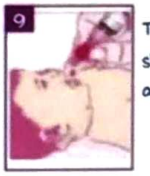


Vaccine vial without aluminum seal

Pull out the rubber stopper

Connect the dropper firmly to the vial.
Write date and time of opening the vial.

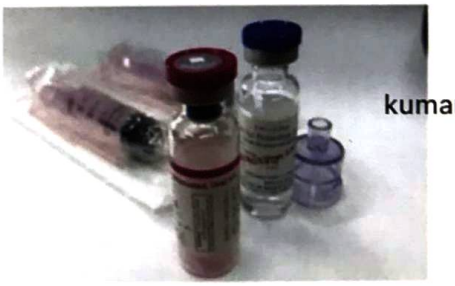
Position dropper at 45° angle. Administer 5 drops into the mouth of the baby 0.5mL = 5 drops*
*The dropper should not touch the mouth of the baby.



Tear off as shown to remove aluminum seal

Once opened the multi dose vial should be kept on conditioned icepack (2°-8°) and cannot be used beyond 4 hours.

Rotasil vaccine : Contains vaccine vial, diluent, syringes, adapter. Dose is 2.5 ml.

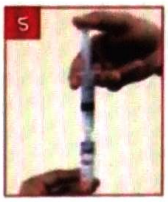


Steps in administration of Rotasil vaccine :

- Remove the adapter from the packing by tearing the wrapper from the wider side of the adapter.
- Caution: Hold the adapter from the body so that you do not touch the tip and the pointed end of the adapter.

- Fix the adpter from wider end by piercing the rubber cap of the diluent.

- Peel open the syringe from the plunger side.
- Draw 3 ml of air into the syringe.



- Fix the syringe on the adapter.
- Push the air inside the diluent vial.

- Withdraw entire amount of diluent into the syringe.

- Hold the adapter and remove the diluent vial, ensuring that the adapter remains with the syringe containing the diluent.

- Fix this adapter along with the syringe containing the diluent over the vaccine vial by piercing the rubber cap.

- Push the entire amount of diluent into the vaccine vial.
- Remove the syringe from the adapter ensuring that adapter remains with the vial.
- Now draw 1ml of air into the syringe.
- Attach the syringe into the adapter and push the air into the reconstituted vaccine.

60c6b3eeaa8ded0e4e7e5ea7

- Draw 2.5 ml of reconstituted vaccine.
- Separate the syringe containing vaccine, ensuring that adapter remain with the vial.

BRIDGE : Boosting Routine Immunization Demand Generation. Initiative to increase the demand generation of the vaccine and increase the coverage to >90%.

Active space

VACCINE IN SPECIAL SITUATIONS, WASTE MANAGEMENT & AEFI

Immunization in disaster 00:00:25

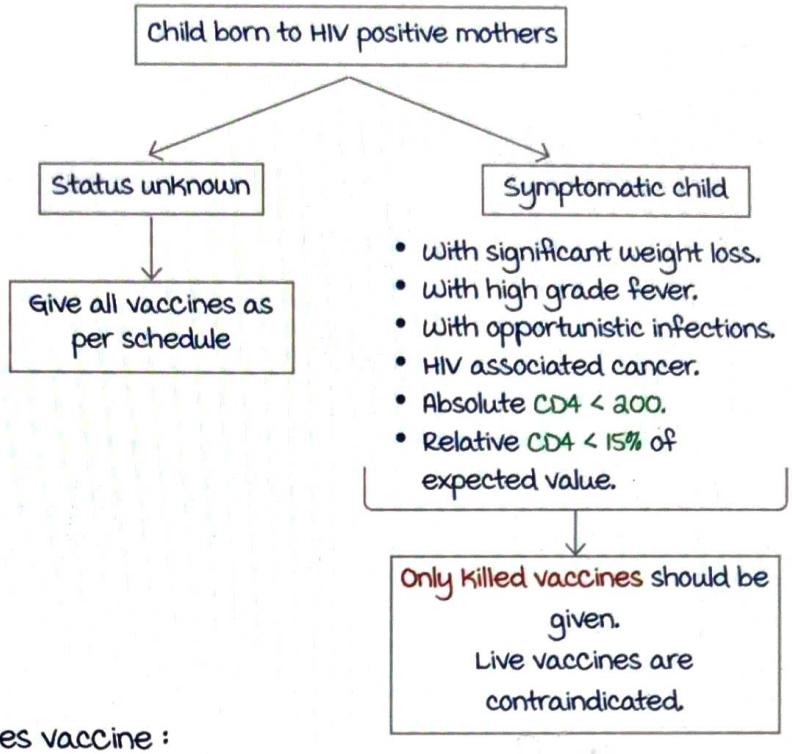
All front line workers (army, disaster response force, health care professionals) require Tetanus toxoid and Hepatitis B vaccine.
Vaccination is not required for general population during disaster.
Most common disease during the disaster is acute gastroenteritis which eventually leads to malnutrition and can cause vitamin A deficiency.
Most common vaccine preventable disease is measles.
In case of any disaster, > 85% measles vaccination coverage is required.
If the coverage is less or if the child is at risk, a supplementary round is required to increase vaccine coverage.
Cholera vaccine is not given during disaster due to variable carrier stages such as chronic carriers, incubatory carriers and convalescent carriers which are the force of infection.

Child with diarrhoea 00:03:36

OPV vaccine is given to child with diarrhoea as per schedule, but it is not counted and repeat OPV vaccination is required after four weeks.

Immunization in HIV

00:05:03



Rabies vaccine :

- No contraindications to any individual whether immunocompetent or immunocompromised as it is a 100% fatal disease.
- In case of HIV positive or symptomatic or with low CD4 count, implies the patient is immunocompromised, Rabies immunoglobulin along with Rabies vaccine (given intramuscularly : for better immunity) in case of both Class II and Class III animal bite.

OPV :

OPV vaccine is given with caution in HIV positive people as it has higher risk of Vaccine Associated Paralytic Polio (VAPP).

Immunization : Rubella outbreak

00:09:45

Special vaccination strategy followed :

First preference : Second preference : Next preference :

Active space

Pregnancy should be postponed for at least 3 months after Rubella vaccine.

Immunization : Measles outbreak/supplementary immunization activity (SIA)

00:11:55

In case of measles outbreak an extra round of supplementary measles vaccine is given to all children of age 9 – 15 years.

MCV – 0 dose (extra measles vaccine dose) is given to child around 6 – 9 months age :

- During measles outbreak.
- During campaigns in settings where the risk of measles among infants < 9months of age remain high (e.g., in endemic countries experiencing regular outbreaks).
- For internally displaced populations and refugees, and populations in conflict zones.
- For individual infants at high risk of contracting measles (e.g., contacts of known measles cases or in settings with increased risk of exposure during outbreaks such as daycare facilities).
- For infants travelling to countries experiencing measles outbreaks.
- For infants known to be HIV infected or exposed (i.e., born to an HIV infected woman).

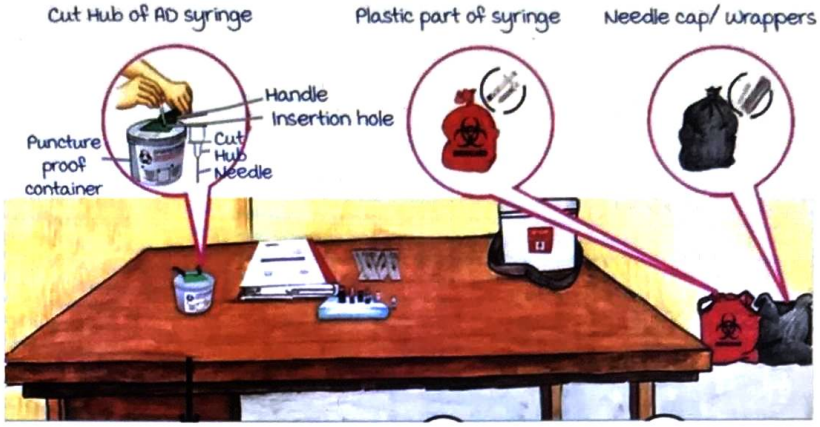
During measles – Rubella (MR) campaign, the strategy used to launch a new vaccine (second dose) is the Catch up – Keep Up – Follow up :

Catch up	One dose of MR vaccine is given to all in age group, 9 months – 15 years.
Keep up	Start the second dose of MR vaccine.
Follow up	Continue the second dose.

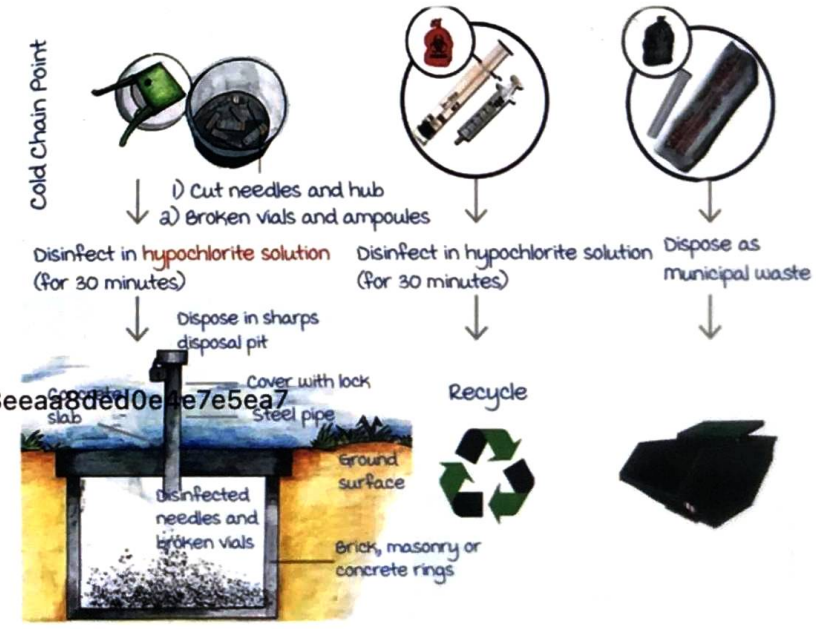
Waste disposal for immunization

00:16:28

How to dispose the syringes and needles after a field immunization camp?



Type	Category	Disinfected by	Put them in
General waste (Needle - cap/ wrappers)	Black	--	Municipal waste
Plastic syringe	Red	Hypochlorite solution for 30 minutes	Recycle
Broken vials / ampoules, needles, sharps	White	Hypochlorite solution for 30 minutes	Sharp pit



Active space

Adverse events following immunization/AEFI 00:20:31

AEFI	Characteristics
Product related	Inherent property of the vaccine.
Quality related	Always happens in clusters related to defect in quality of vaccine.
Immunization error	Also known as Program errors (very serious errors) which talks about quality of immunization program. • Non sterile method. • Inappropriate route of administration of vaccine. • Abscess, infection of injection site. • Toxic Shock Syndrome (TSS) : Due to expired or contaminated vaccines.
Anxiety related	Not related to a specific vaccine.
Coincidental error	Just by chance.

Vaccine	Side effects
Hepatitis B	Anaphylaxis.
BCG	Most common : Scar, fever. Suppurative lymphadenitis after one month of vaccine.
OPV	Vaccine associated paralytic polio : • Recipient : If a child had taken OPV before 4 – 40 days of onset of paralysis. • Contact : In contact with a child who received vaccine within 4 – 75 days of having onset of paralysis.
Pertussis	Unconsolable cry (most common side effect). Neurological deficits. Encephalopathy. Hypotonia (most common neurological side effect).
Tetanus Toxoid	Brachial neuritis even after one week – few months of vaccine. Incidence : 5 – 10/million injections.

Pertussis vaccine can worsen the neurological deficit in a person.

Active space

Dravet syndrome :

- Also known as myoclonic epilepsy of infancy.
- Is not associated with Pertussis vaccine as such but is coincidential.
- Genetic disease due to defect in SCN1A gene.

Time of AEFI

00:31:32

Time of AEFI	Reactions reported
24 – 48 hours	Acute hypersensitivity reactions, inconsolable screaming, anaphylaxis.
With 7 days	Local reactions, sepsis, injection site abscess.
Within 14 days	Seizures, encephalopathy.
Within 3 months	AFP, brachial neuritis, thrombocytopenia, intussusception (Rotavirus).
Within 1 year	Lymphadenitis, osteitis (BCG).

SMALL POX AND CHICKEN POX

Small pox

00:00:16

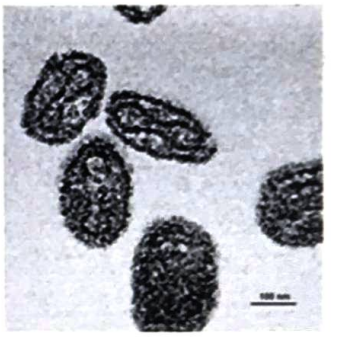
Globally eradicated : Variola virus, Poxviridae ds DNA.

Clinical features :

- High grade fever.
- maculopapular rash → vesicles → pustules
  No pleomorphism. All rashes in the same stage (either vesicle/pustule)
- Diagnosis by laboratory confirmation.

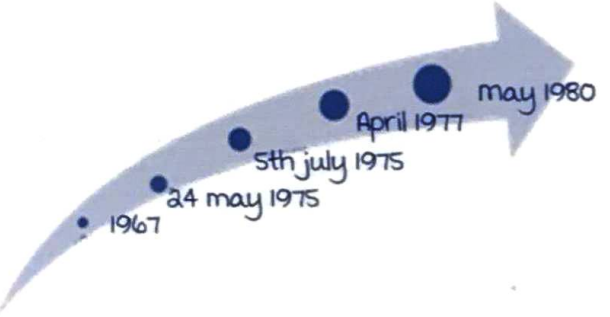
Small pox rash pattern

Measles rash pattern



Historical relevance :

- Small pox vaccine discovered in 1796 by Louis Pasteur.
- 1967 WHO started smallpox vaccination on a global scale.
- 24th may 1975 : Last small pox case detected in India.
- 5th July 1975 : India declared small pox free country.
- April 1977 : India declared small pox eradicated country.
- may 1980 : Global eradication declared by WHO.

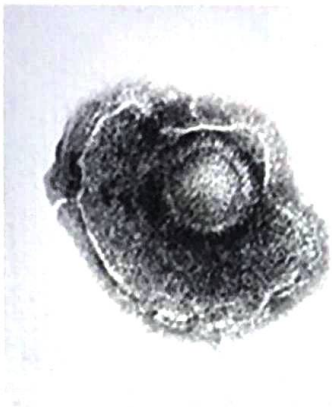


Active space

Chickenpox

00:03:53

Caused by varicella zoster virus (Human herpes virus 3, ds DNA).



Agent factors :

- Source : Cases of chicken pox.
  Scabs are not infective.
  Vesicle fluids are infective.
- Period of Communicability : 1-2 days before and 4-5 days after the onset of rash.
- Secondary Attack Rate (SAR) : 85-90%.

Host factors :

- Age : Early school going children (<10 years ,Peak age).
- Immunity :
  Lifelong immunity.
  Chance of reactivation of latent infection (Zoster infection).
- Pregnancy :
  Infection in first 20 weeks of pregnancy has high chance of congenital varicella syndrome (0.4 - 2%).

Environmental factors :

- Shows seasonal trend : In winter and spring (From January to April).
- Can survive for 24-48 hours outside the body.
- Easily destroyed by chemicals : Solvents, detergents.

Active space

Mode of transmission :

Direct mode	Indirect mode
Droplet transmission Transplacental mode	Airborne mode (Infections having airborne transmission : IMCTC (Influenza, measles, Chicken pox, Tuberculosis, Covid-19)

Incubation period : 10–21 days (Average 14–16 days).

Clinical features

00:11:40

1. Pre-eruptive phase (prodromal phase) :
   Fever, Coryza.
2. Eruptive phase :
   Start in trunks.
   Spreads to whole body (not in palms/soles).
   Rash will show pleomorphism (different levels of rash at a single point of time).
   Scabs develop around 4–5 days (not infective).

Complications of chicken pox (<1%) :

- Hemorrhage.
- Severe Pneumonia.
- Encephalitis.
- Acute encephalopathy with fatty degeneration of viscera (Reye's syndrome : rare).

Varicella in pregnancy causes congenital varicella syndrome :

- Cutaneous scars.
- Limb atrophy.
- Cortical atrophy.
- Microcephaly.
- Micropthalmia.
- Chorioretinits.
- Deafness.

Diagnosis :

- Varicella zoster virus : DNA PCR.

Prevention & control

00:15:24

1. Active immunization : Live vaccine.
2. Passive immunization :

By giving Varicella Zoster Immunoglobulin (VZIG).

Indication of VZIG :

- Pregnant female with known exposure to varicella.
- Severe immuno compromised state :
  - HIV positive and symptomatic for HIV.
  - Long term steroid therapy.
  - Infants borne to varicella infected mothers.

VZIG given within 72 hours of exposure at the dose of 60e6b3eeaa8ded0e4e7e5ea7
12.5 U/kg (maximum of 625 U).

In case of prolonged exposure, VZIG may be repeated after 3 weeks.

VZIG : Never combine with varicella vaccine.

Active immunization :

Live attenuated vaccine.

Strain : OKA strain.

Dose : 0.5 ml S/C injections : 2 doses at 12 - 18 months of age.
Booster dose in 4 - 6 years.

Recommendations for vaccine :

- Ideal age of vaccination : 12-18 months of age.
- Can be given to all children till 12 years.
- In case of varicella exposure, adults > 13 years can be given.
- The gap between 2 primary doses should be between 1-3 months (< 12 years) & 4-8 weeks (> 13 years).

Post exposure prophylaxis :

In case of known exposure to varicella virus, varicella live vaccine (OKA vaccine) given within 5 days of exposure.

Contraindications :

- Severe immune compromised state.
- Pregnancy.
- Anaphylaxis.

MEASLES, MUMPS AND RUBELLA

60c6b3eeaa8ded0e4e7e5ea7

These are respiratory borne infections.

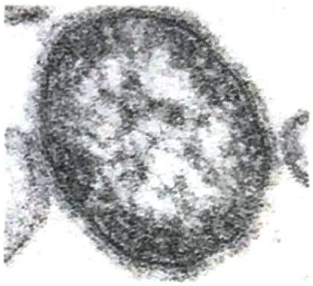
Measles

00:00:50

Epidemiological determinants :

Agent factors :

- Single Stranded (SS), negative sense RNA virus.
- Family : Paramyxovirus.
- Genus : Morbilliform virus.



Source : Case of measles.

No carriers.

Very few subclinical cases.

No animal reservoir.

Period of communicability :

4 days before & 4 days after onset of the rash.

Immunity :

- One infection provides lifelong immunity.
- Secondary attack rate (SAR) : 80 – 85% in unimmunized children.

Host factors :

Age : 6 months to 3 years in developing countries.

> 5 years in developed countries.

Nutritional status : Malnourished children are more affected.

Environmental factors :

- No seasonal association.
- Peaks during January (winter) & April (spring).

Incubation period (IP) :

- It is time from entry of the organism to the first sign/symptom.
- 1st sign/symptom of measles is fever (IP: 10 days).
- Rash appears on 14th day from onset of infection (median incubation period).

Active space

- IP of measles : 12-16 days.
- In case of vaccine induced measles, IP is 7 days.

Mode of transmission :

- Droplet.
- Droplet nuclei (airborne) 60c6b3eeaa8ded0e4e7e5ea7

Diseases with airborne transmission :

Mnemonic : IMCTC.

1. Influenza.
2. measles.
3. Chicken pox.
4. Tuberculosis.
5. COVID-19.

There are 3 stages of measles infection namely,

Prodromal stage.

Eruptive stage.

Post measles stage.

1. Prodromal stage :

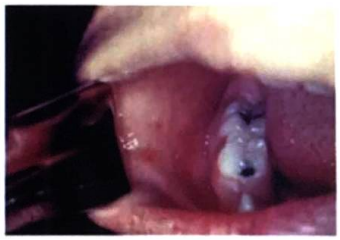
   Lasts 3-5 days.

   Fever, coryza, running nose (non specific features).

   Diarrhoea may be seen.

   Koplik spots :

   - Small whitish spots in buccal mucosa near 1st/2nd lower molars.
   - Pathognomonic of measles.
   - Seen 2-3 days before rash.



Koplik spots

2. Eruptive stage :

   Onset of macro papular rash.

   Starts behind the ear (posterior auricular rash) & it extends down.

   Takes 2-3 days to spread to whole body & takes another 4-5 days to disappear (6 to 8 days in total).

Peak viral shedding is 2-5 days after onset of rash.

3. Post measles stage :

   Presents with weakness, weight loss.

Active space

Most common associated feature in measles (apart from fever & rash) is Diarrhoea.

Complications in children :
Otitis media, pneumonia, encephalitis or any visceral inflammation.

- Most common complication : Otitis media.
- Most common fatal/severe complication : Pneumonia.
- Most common cause of death : Pneumonia.
- Rare complication : Subacute Sclerosing Pan Encephalitis (SSPE).

High chances of abortion if infected during pregancy.

Diagnosis and management of measles 00:13:19

Measles is diagnosed Clinically.
Confirmatory/Gold standard investigation : PCR test.
Management : No treatment for measles.
Vitamin A prophylaxis :

< 6 months : 50,000 IU.
6 months – 1 year : 1 lakh IU.
1–2 years : 2 lakh IU.

Measles vaccine :

- Strain : Edmonston Zagreb strain.
- Type : Live attenuated vaccine, freeze dried vaccine (Diluent is Distilled water).
- Measles containing vaccines (MCV) : MR, MMR, MMRV.
- Dose : 0.5 ml, given subcutaneously in right upper arm at 9 months & 16–24 months. Can be given IM also.
- Duration of immunity : Starts within 11–12 days after immunization providing almost lifelong immunity.
  MCV 1st dose : 85% protection, 2nd dose : 98% protection.

Thermal sensitivity of MCV :

- Heat & light sensitive.
- Color : Amber colored.
- At 37°C : Becomes non potent within 1 hour.
- Best temperature : +2 to +8°C.

- Reconstituted measles vaccine should be used within 4 hours.
- Does not follow the open vial policy.

Side effects of measles vaccine :

1. Measles like illness :
   - Most common side effect.
   - Short duration illness : 1–3 days (low intensity fever ± rash).
   - IP : 7 days.
   - Product (vaccine) related problem.
2. Toxic shock syndrome :
   - Rare.
   - Due to contamination of vaccine.
   - It is an [illegible] side effect because of low quality of immunization program.

Precautions with measles vaccine 00:24:19

Contraindications to measles vaccine (live vaccine) :

1. Severe immunocompromised/HIV patients.
2. Pregnancy.
3. Severe acute illness.
4. Recipient of blood products.
5. Anaphylaxis to Neomycin, Erythromycin.

Avoid pregnancy for 4 weeks after taking the vaccine (live).
Tuberculin sensitivity test (TST) will show decreased result.
So, postpone for 4 weeks after vaccination.
Blood products & immunoglobulins : Should be avoided for 3–6 months after vaccination.
Post exposure prophylaxis (PEP) :

- PEP is given in a person exposed to the disease.
- Age > 9 months, PEP of choice is MCV (given within 72 hours of exposure).
- Any contraindication or age < 9 months : measles Ig 0.25 ml/kg is given within 72 hours of exposure).
- In all recipients of measles Ig, MCV should be given after 8–12 weeks.

Measles outbreak measures :

- Measles outbreak may happen in an area every 2-3 years (cyclical trend).
- Supplementary Immunization Activity (SIA) is followed.

Immunization during measles outbreak/SIA :
MCV-0 dose (extra measles vaccine dose) is given to a child around 6-9 months of age,

- During measles outbreak.
- During campaigns in settings where the risk of measles among infants < 9 months remains high (e.g. in endemic countries experiencing regular outbreaks).
- For internally displaced populations and refugees and populations in conflict zones.
- For individual infants at high risk of contracting measles (e.g. Contacts of known measles cases or in settings with increased risk of exposure during outbreaks such as day-care facilities.
- For infants travelling to countries experiencing measles outbreaks.
- For infants known to be HIV-infected or exposed (born to a HIV-infected woman).

Any vaccine given under SIA (Eg : MCV-0 dose) is always considered as an extra dose & > 4 weeks gap between 2 doses must be ensured.
Measles Rubella 2nd dose strategy :
Catch-up : Extra dose of MR to all children < 15 years.
Keep-up : Integrate the 2nd dose.
Follow-up : Currently, we are in the follow-up phase of MR.

Mumps

00:34:02

Epidemiological determinants of mumps :
Agent factors :

- Single negative sense RNA virus.
- Organism : Myxovirus parotiditis.

Source : Clinical cases/subclinical cases.
30-40% of cases are subclinical.

Period of communicability :

4-6 days before the onset of disease & 7 days after the onset (10-14 days).

Immunity :

- Lifelong immunity.
- SAR : 85 %.

Host factors :

Age : Pre school children aged 5-9 years.

Environmental factors : Seen between Winter to Spring.

Incubation period :

- IP : 2-4 weeks.
- Median IP : 14-18 days.

Mode of transmission is via droplets.

Clinical features :

High grade fever with swelling of salivary glands (most commonly parotid glands).

Organs involved :

1. Parotid, sublingual, submandibular gland.
2. Testes.
3. Pancreas.
4. CNS.
5. Ovaries.

Complications :

- Orchitis (most common complication).
- Ovaritis.
- Pancreatitis, thyroiditis.
- Meningitis, encephalitis.

Mumps in pregnancy :

25% chance of abortion.

No chance of congenital mumps.

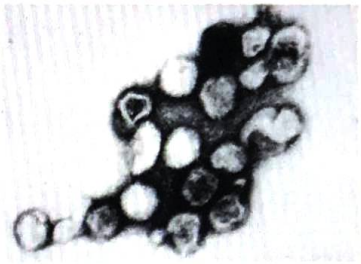
Prevention and control using Mumps vaccine : Low effectivity.

Strains :

1. Jeryl lynn (most commonly used strain).
2. RIT 4385.
3. Leningrad-3.
4. Urabe.
5. Rubini (not used anymore).

Rubella

- Short lasting disease (3–4 days of fever & rash).
- Causes Congenital Rubella Syndrome (CRS).



Epidemiological determinants :

Agent factors :

- SS, RNA virus.
- Family : Togaviridae.

Source : Clinical/subclinical cases.

50–60% cases are subclinical.

Subclinical cases :

- measles : No subclinical cases, no carrier (no iceberg phenomenon).
- mumps : 30–40% subclinical cases (shows iceberg phenomenon).
- Rubella : 50–60% subclinical cases (shows iceberg phenomenon).

Diseases that do not show iceberg phenomenon :

Tetanus.

Rabies.

Measles.

Period of communicability :

7 days before the rash & 7 days after the onset of rash.

Immunity : Lifelong immunity.

Host factors :

- Affects children 3–10 years in developing countries.
- Affects adolescents (> 14 years) in developed countries.

Environmental factors :

Seen during Winter & Spring.

Incubation period is for 2 to 3 weeks.

Mode of transmission :

Droplet borne respiratory route of transmission.

Clinical features of Rubella

00:44:33

Rubella is also called 3 day fever/3 day sickness.

1. Prodromal stage :
   Fever ± coryza.
2. Lymphadenopathy :
   Predominently cervical & posterior auricular lymph nodes are involved. Not characteristic.
3. Rash :
   - Inconsistent.
   - Very small rashes ± Pruritis.
   - Starts from face & moves downwards.

Diagnosis :

1. Hemagglutination inhibition test : Serological test.
2. ELISA antibody test :
   - IgG : Previous/past infection.
   - IgM : Recent infection.
   - In pregnant females : Do Serial IgM testing every 10 days.
   - For infants born to a rubella positive mother : Check IgM antibodies.

Congenital Rubella Syndrome (CRS) :

- Peak age for CRS : 8-10 weeks of gestation (early pregnancy).
- Triad : Ophthalmic defects (cataract), auditory defects (SNHL), cardiac defects (PDA).

Rubella vaccine :

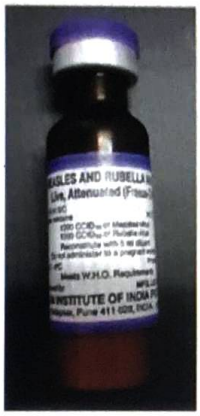
- Strain : RA 27/3.
- Type : Live attenuated.
- Dose : 0.5 ml, given subcutaneously in right upper arm.
- Immunity status : Starts from 11-12 days, renders lifelong immunity.

In all MCV, dose of measles & rubella should be > 1000 $CCID_{50}$.
Cell Culture Infective Dose 50% ($CCID_{50}$) : Amount of virus required to cause cytopathic effects in 50% of the inoculate in cell culture.

Prevention and control with Rubella vaccine :

- Avoid pregnancy for 4 weeks.
- Contraindicated in Severe immuno compromised : HIV symptomatic/CD4 count < 200 cells/relative CD4 count < 15%.
- Blood products & immunoglobulins should be avoided for 3-6 months after vaccination.

Vaccination strategy during rubella outbreak :
1st Priority : In all non pregnant WRA.
2nd priority : 1-14 years children.
3rd priority : < 1 year children.



Rubella/MR vaccine is not given along with yellow fever vaccine (especially < 2 years children) because they both bind together. Immunity develops for neither of the diseases.

Global measles and rubella strategic framework : 2021-30

00:53:46

1. To promote MR vaccination : > 95% coverage.
2. Low incidence of measles : < 5 cases/million/year.
3. Combat outbreaks with vaccination.
   Outbreak of measles : Every 2-3 years.
   Outbreak of rubella : Every 5-9 years.

In case of measles outbreak :

- SIA.
- Isolate the case for atleast 7 days after onset of rash.
- PEV to all household contacts (age < 15 years) : Within 2 days of exposure.

FLU, DIPHTHERIA AND PERTUSSIS

60c6b3eeaa8ded0e4e7e5ea7

Flu 00:00:32

1. Source : Clinical and subclinical (50–70%)
   - Flu pandemics (every 7–10 years).
   - Shows the iceberg phenomenon.
   - Major public health problem.

   Reservoirs : Animals, bats, birds.

   Mode of transmission : Droplet / Airborne/ Droplet nuclei.
2. Incubation period : 18 – 72 hours.
3. Period of communicability : 1 – 2 days before the onset of symptoms to 1 – 2 days after the onset of symptoms.

In India, H_1N_1, H_3N_2 & Influenza Type B viruses are present.
Among these, H_1N_1 is the most circulating virus in India (2019 Flu surveillance). H : Hemagglutinin ; N : Neuraminidase.

4. Specific Features :
   - SAR (Secondary Attack Rate) : 50 – 60% among the non immune.
   - Basic reproduction number (R_0) : 1 – 2.
     Can go up to 3 in epidemics.
   - Case Fatality Rate (CFR) : 1 – 2%
5. Immunization, prevention & control :
   - Drug of choice (DOC) : Oseltamivir 75 mg
   - B.D. dose for treatment
   - O.D. for prophylaxis.
   - Vaccines :

   Live Attenuated Vaccine : Nasal spray.

   Killed Vaccine : Egg-based vaccine.

Killed Vaccine	Trivalent Egg based	Quadrivalent Egg based
C/I in persons with egg allergy	Hong Kong strain Guangdong strain Washington strain	Phuket strain

Diphtheria 00:08:08

MC age of presentation : 1 – 5 years.

1. Source : Case.

   Carrier : Healthy, chronic, incubatory.

   Nasal carriers are more dangerous than throat carriers.

   Carrier stage range : 0.1 – 5% in an area.

Immunity to diphtheria does not protect from a carrier stage.
Hence, carriers can be immune to diphtheria.
Mode of transmission : Nasopharyngeal secretions.

- Droplets.
- Fomites.
- Direct contact.

2. Incubation period : 2 – 6 days.
3. Period of communicability :

   - Untreated diphtheria may spread for 14 – 28 days of disease onset.
   - Treated diphtheria = Non – infectious within 48 hours.
   - Carrier is declared non infectious if 2 negative culture reports, done atleast 24 hours apart.
4. Specific features :
   - Secondary Attack Rate (SAR) is not applicable for Diphtheria.
   - CFR, if untreated = 10%.
5. Immunization, prevention, & control :

Cases :
Diphtheria Antitoxin (DAT) – 20,000 to 1,00,000 IU.

- Given after a skin sensitivity test.
- I.M. : Mild to moderate cases.
- I.V. : Moderate to severe cases.

Antibiotics :
DOC : Penicillin G or Erythromycin – 12 to 14 days.

- Serial cultures : To know the response to the treatment.
- Diphtheria toxoid : Given only in the convalescent phase if the patient is not immunized.
- Carriers : DOC is oral Erythromycin – At least for 10 days (up to 12 – 14 days).

Contacts :
Assess for any signs/symptoms.
Send samples for the culture of Corynebacterium diphtheriae.
Antibiotics : Have to be given to all contacts.

- Penicillin G or oral Erythromycin 7 – 10 days.
- Stopped if the culture reports are negative.

Diphtheria toxoid : Based on immunization status.

- Unknown status /<3 doses : Give diphtheria toxoid & complete the series (3 primary + 2 booster doses).
- > 3 doses & last dose taken > 5 years ago : Give single diphtheria toxoid booster dose.
- > 3 doses & last dose taken within 5 years : Continue the NIS (National Immunization Schedule) & give vaccine which is due.

Active space

DPT vaccine/Pentavalent vaccine (PV) :

DPT + HiB + Hep B.

- Dose, route & site of administration : 0.5ml, IM, left anterolateral thigh.
- Schedule : 3 primary + 2 booster doses – 6, 10 & 14 weeks + 16–24 months & 5 years.
- S/E : Neurological problems (due to Pertussis component).
- DPT/PV are freeze sensitive (never put the vaccine on the ice pack).
- Shake test is used for freeze-sensitive vaccines.

Td vaccine : For adults.

"d" stands for low dose diphtheria vaccine.

Pregnant ladies receive 2 Td doses.

10 – 16 years age group receive Td vaccine.

Pertussis 00:25:42

MC age of presentation : < 5 years.

Aka 100 days cough / Whooping cough.

1. Source : Humans. No subclinical or carriers seen.
   Mode of transmission : Droplets / Fomites.
2. Incubation Period : 7 – 14 days.
3. Period of Communicability : From 1 week after exposure till 3 weeks of paroxysmal stage.

   Clinical stages in Pertussis :
   - Catarrhal stage (10 days).
   - Paroxysmal stage (2 – 3 weeks).
   - Convalescent stage (1 – 2 weeks).

Maximum communicability is in the early paroxysmal stage (1 week – 3 weeks)

4. Specific Features :
   - Cl[redacted]kumarankitindia1@gmail.com
   - SAR : 90% in unimmunized.
5. Immunization, Prevention, & Control :
   - DPT vaccine :
     The pertussis component is responsible for neurological complications.
     S/E : Inconsolable cry, screaming, irritable child. hypotonic, hyporesponsive states.
     Contraindication : children with seizure disorders & in progressive neurological deficits.
   - DOC for Pertussis : Erythromycin.

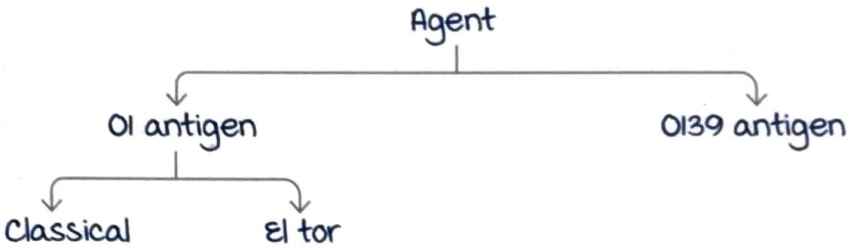
Active space

CHOLERA & DIARRHOEAL DISEASE CONTROL PROGRAM

Father of Epidemiology : Dr. John Snow.
Father of public health : Cholera.

Cholera

00:01:14



Both can be of Ogawa, Inaba, Hikojima serotypes.
Ogawa is common in India.

The reservoir is human.
Source : A case or carrier.
75% of cases do not develop the disease.
They stay as carriers or subclinical cases.

Carriers :
Temporary carriers : Can spread for 8-10 days.

- Contact carriers
- Convalescent carriers
- Incubatory carriers
- Healthy carriers

Chronic carriers : Can spread for weeks to months.
Temporary carriers spread more than chronic carrier(rare in cholera).

Incubation period : 1-2 days.
Period of communicability - wide range of 8 days to weeks/ months.

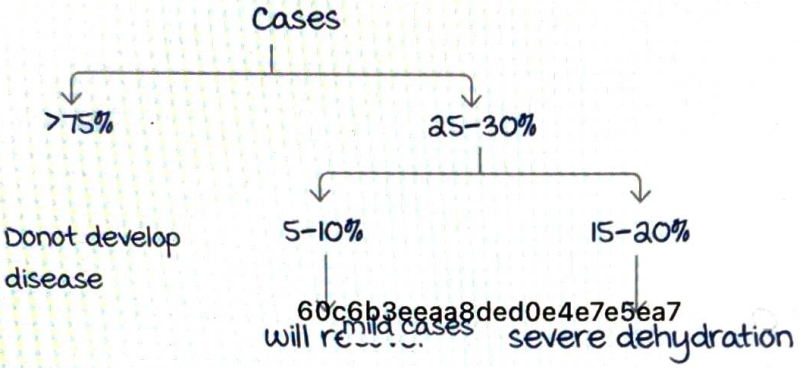
Active space

Carrier stage	Infective period
Incubatory carrier	1–5 days
Convalescent carrier	2–3 weeks
Contact carrier	10 days
Chronic carrier	months to years
Case of cholera	8–10 days

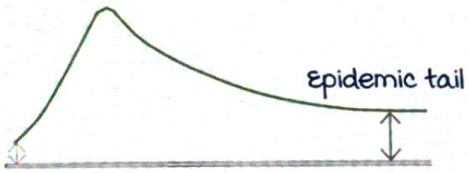
Mode of transmission : Water > food/fomite/direct contact.

Special cases :

1.



2. Epidemic tail phenomenon : Once an epidemic/outbreak of cholera occurs, it takes a very long time for the tail to settle down.



Determinants of epidemic tail :
The force of infection, either through contaminated water source or through contacts.

Immunity, prevention, and control 00:10:27

1. Cholera is a notifiable disease under IHR 2005 by WHO.
   Other notifiable diseases under IHR 2005 : CYPIP (mnemonic)
   Cholera, Yellow fever, Plague, Influeza (SARS), Polio.
2. Oral rehydration therapy + zinc.
3. Antibiotics are recommended to be used 3–4 hrs after rehydration therapy : Tetracyclines, Fluoroquinolones, Trimethoprim/ sulfamethoxazole can be given.

4. Sanitation measures.
    - Safe water supply.
    - Food hygiene.
    - Improved excreta disposal.
    - Disinfection.

Disinfectant of choice : Coal tar disinfectants. (RW co efficient >10).

Riedel Walker (RW) coefficient : Efficiency of disinfection.

6. Chemoprophylaxis : Doxycycline 500mg BD in adults, 125mg BD in children for 3 days.

7. Vaccines :

Dukoral	Sanachol
• ~50% effective • For O1 type. • Effectivity starts after 7 days the 2nd dose. • Effective for 2 years. • Contains B subunit, so oral suspension + effervescent granules (buffer). • 2 doses, 1-6 weeks apart. • Not given to <2 yrs child.	• ~50% effective • For O1 and O139. • Effectivity starts from 7 days after the 2nd dose. • Effective for 3 years. • Only oral suspension, No gastric buffer required. • 2 doses, 2 weeks apart. • Not given to <1 yr child.

Dukoral comes in powdered form,

For adults, dissolved in 150ml.

For children (<6 yrs), dissolved in 75ml of water.

Euvichol is a more stable vaccine, given in some countries.

Emporiatrics :

The science dealing with the study of travellers.

Sanachol vaccine is given to them.

Diarrhoeal disease control program 00:20:45

Components :

1. Short term : Early diagnosis, prompt treatment.
2. Long term : Promote MCH care.
   Promote preventive care.
   Promote prevention of diarrhoeal outbreak.

Promote preventive care for diarrhoeal diseases by :

- Improve sanitation.
- Increased treatment facilities.
- Improved immunization (iMI-2.0)
- Improved nutrition.
- Increased supply of micronutrients.
- increase rotavirus immunization.
- Inhibit/ prevent diarrhoeal outbreaks.

Global action plan for prevention and control of pneumonia and
diarrhea (2010) :

U5 [under 5 years] pneumonia deaths <3/1000 LB.

U5 diarrhoeal deaths <1/1000 LB.

60c6b3eeaa8ded0e4e7e5ea7

Pneumonia and diarrhea cases < 75%.

Stunting prevalence to decrease by 40%.

To be completed by 2025.

TYPHOID AND AMOEBIASIS

Typhoid

00:00:21

Aka Eberthella typhi.

Clinical features :

- Fever for 3 to 4 days.
- Paradoxical bradycardia.
- Involvement of lymphoid tissue.
- Pea soup diarrhea.
- Rose spots on chest.
- Complications : Hemorrhage / perforation/ relapse.

Typhoid mary : A cook who infected many people in 1901 with Typhoid.

Source : Salmonella typhi

60c0b3eeaa8ded0e4e7e5ea7

Antigen

O : Somatic antigen (specific for the group).

H : Flagellar antigen.

V_i : Capsular antigen (responsible for virulence)

Cases : Male > female

Carrier : Fecal > urinary.

Female > male.

Temporary carrier :

- Incubatory period
- Convalescent period : 6-8 weeks.

Chronic carrier :

- Excretes bacilli > 1 year.
- Around 5% cases.
- Predominantly in gall bladder.

Reservoir : Human

Incubation period : 10 -14 days

Period of communicability : The person can spread the disease as long as the bacilli are present in stool/ urine.

Mode of transmission : Sanitation barriers.

- Water/ fluids.
- Food.

Active space

- Flies.
- Faeces.
- Fingers.

Special features :

- Immunity :
  Post-infection : Increase in O antigen.
  Post-vaccination : Increase in H antigen.
- CFR : 1 – 4%
- Males : cases
  Females : carriers
- Peak age : 5 – 19 years
- Peak season : July- September (monsoon).

Immunity, prevention and control :

Immunity :

Vaccine : Immunity starts after 7 days in both type of vaccines.

60c6b3eeaa8ded0e4e7e5ea7

Ty 21 a	Vi polysaccharide vaccine
Oral	Injectable (SC/IM)
> 5 years	> 1 year
3 doses : 1,3, 5 days (repeated 3 yearly)	Single dose
Cross reacts with proguanil, antimalarials and antibiotics. Minimum gap of 3 days before and after administration.	

Prevention and Control :

- Isolate : Till 3 negative culture reports are obtained on 3 different days from either stool/ urine.
- DOC : Fluroquinolone.

Active space

- In case of multi-drug resistance, DOC : Azithromycin / Cefixime.
- In case of Fluroquinolone resistance, DOC : Azithromycin / Ceftriaxone/ Cefixime.
- In case of known carrier, DOC : Ampicillin/ Amoxicillin + Probenecid
- Ideal management for carrier stage : Cholecystectomy + Ampicillin.
- Disinfection protocol : 5% Cresol x 2 hours.
  Follow up of repeat culture.
  Improved sanitation.

Amoebiasis

00:18:25

Generally among food handlers, travellers.
Global : 2 – 60 %
India : Average 3/1000 population.

- Source : Entamoeba histolytica
  Trophozoite or cystic form.
  Reservoir : Human.
  Source : Human (E. histolytica in cystic form in stool).
- Incubation period : 5– 6 days upto 3 weeks.

Communicability factors :

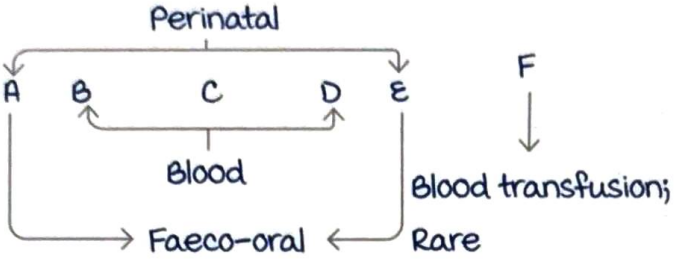
- Period of communicability : As long as the faeces contain cysts.
- Mode of transmission :
  Faeco-oral route (most common).
  Vector borne (rodent).
  Oro-rectal route (sexual).

Special features : Not killed by Chlorine.
Immunity, Prevention and Control :
Prevention :

- 1° Prevention : Sanitation, continuous water supply, food hygiene.
- 2° Prevention :
  DOC : Metronidazole.
  DOC for Carrier stage : Diiodohydroxyquin, Diloxanide furoate.

HEPATITIS

Modes of transmission :



S : Source/Reservoir.
I : Incubation period (IP).
C : Communicability factors.
S : Special points to remember.
I : Immunity, prevention and control.

Hepatitis A

00:01:42

Reservoir : Humans.
Source :

- Case of hepatitis.
- Subclinical hepatitis : Responsible for maintenance of hepatitis in community.
  In adults – Anicteric cases : Icteric cases = 3:1
  In children – Anicteric cases : Icteric cases = 12:1

IP : 10 – 50 days.
Communicability :

- Modes of transmission (MOT) : Faeco-oral and perinatal are the major routes.
  Parenteral route.
  Sexual transmission.

- Period of communicability (POC) :
  2 weeks before and 1 week after onset of signs and symptoms (Jaundice).
  Maximum communicability : During IP and early phase of disease.

Special features :

1. Chlorine levels must be > 1ppm (Normal chlorine levels do not affect the virus).

2. Heat labile when > 60°C.
3. Chemical disinfectant of choice : 0.5 – 1% Sodium Hypochlorite solution.
4. Case fatality rate (CFR) : < 1%.
   It is a self-limiting disease (98% recovery).

Immunity, prevention and control of Hepatitis A

00:07:33

Reservoir control :

- Improve sanitation of community.
- Improve disinfection strategies.

Transmission control :

- Safe water supply :
  Chlorinated water supply > 1 ppm in areas with increased cases of Hepatitis A.
  pH < 8.5.

Vaccine :

- Live attenuated vaccine :
  Subcutaneous.
  Single dose.
  Not very effective, not used commonly.

- Killed vaccine :
  Formaldehyde inactivated virus vaccine.
  For high risk cases – lab professionals, people traveling to hepatitis A endemic areas.
  Given to age > 1 year.
  2 doses taken 6 – 12 months apart.
  Lifelong immunity.

Hepatitis A immunoglobulin :

- 90% effective if given within 14 days of exposure.
- Can be given with Hepatitis A vaccine.
- Dose : 0.05 – 0.1 ml/kg, i.m.

Hepatitis B

00:12:41

Introduction :

- Global prevalence : 3.5 %.
- Prevalence in India : 5–7%.
- 5 – 15% cases may be associated with HIV and/or Hepatitis C Virus (HCV).
- Increased risk of hepatocellular cancer (HCC) and cirrhosis.

Reservoir : Humans.

- Chronic carriers : Have HBsAg > 6 months.
  Major source of Hepatitis B, maintaining the infection in the community.

Source : Case/ Carrier.

IP : 30 – 180 days (1 – 6 months).

Communicability :

- POC : Till HBsAg is positive in blood.
- MOT : Blood (parenteral) is most common.
  Sexual transmission.
  Body secretions (saliva).

Special features :

- Heat labile.
- Disinfectant of choice: Sodium hypochlorite 0.5 – 1 %.

Immunisation in Hepatitis B

00:17:08

Passive immunisation : Hepatitis B Immunoglobulin (HBIg)

- Dose : 0.05 – 0.07 ml/kg.
- 2 doses given 1 month apart.
- Given in cases of known exposure, within 6 hours and not later than 48 hours.

Active immunisation: Recombinant virus vaccine.

- Children :
  Dose : 0.5 ml IM in anterolateral aspect of left thigh.
  At birth (within 24 hours), 6, 10 and 14 weeks.
  Under national immunisation schedule – given to all children < 1 year.

- Adults :

  Dose : 1ml IM injections.

  3 doses : 0, 1, 6 months.

  Given in high risk cases.

  Safe in pregnancy.

Accidental exposure to hepatitis B :

- HBIg + HBs antibody testing.
- Hepatitis B Vaccine.

Hepatitis B vaccine is not given when :

- HBs antibody > 10 mIU/ml.
- Known case of HBsAg positivity.

Immunoglobulin and vaccine can be given together in :

1. Diphtheria.
2. Rabies.
3. Tetanus.
4. Hepatitis B, A.

Prevention and control of Hepatitis B

00:23:29

Categorisation of areas based on prevalence in India :

Hepatitis B prevalence	Category
< 2 %	Low risk
2 – 4 %	Intermediate low risk
5 – 7 % (overall national prevalence)	Intermediate high risk
> 8%	High risk

WHO SCs strategy :

1. Consent.
2. Confidentiality.
3. Correctness of diagnosis.
4. Counselling.
5. Connections.

WHO Global health strategy (2016 – 2021) :

Objectives :

- Decrease case load of hepatitis B by 90% by 2030.
- Decrease mortality due to hepatitis B by 65% by 2030.

Strategies :

- To promote hepatitis B vaccine.
- Prevention of mother to child transmission.
- Harm reduction in high risk groups (IV drug abusers, male to male, transgender), safe blood practices.
- Early diagnosis and prompt treatment.

Hepatitis C

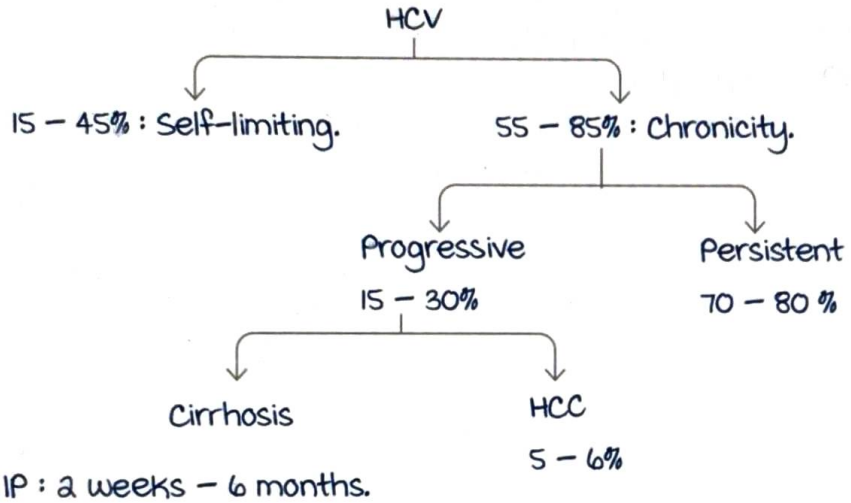
00:29:13

Prevalence in India : 0.5 – 1.5%.

Reservoir : Humans.

Source :

- Clinical case.
- Subclinical case : 80 – 90% of Hepatitis C cases.



IP : 2 weeks – 6 months.

Communicability :

- POC :
  1 week before onset of symptoms.
  Maximum communicability is during the IP.
- MOT : Blood (Transfusion, IV drug abusers, Organ transplant, perinatal).

Special features :

1. Causes HCC and cirrhosis (HCV is the most common cause of cirrhosis in India).
2. Diagnosis : 60c6b3eeaa8ded0e4e7e5ea7
   Gold standard : RT-PCR.
   HCV-RIBA (Recombinant immunoblot assay).

Immunity, prevention and control :

Control : Directly acting anti-viral (DAA) therapy.

Prevention :

- Promote safe blood practices.
- Improve sanitation.

Hepatitis E

00:36:38

Non-A, non-B virus.

It is an RNA virus.

Most common type of hepatitis E prevalent in India : Genotype I hepatitis E.

Source :

- Clinical case.
- Asymptomatic case : Responsible for maintenance of infection in the community.

IP : 3 – 8 weeks (30 – 40 days).

Communicability :

- POC : more communicable during the IP.
- MOT : Faeco-oral route (Water borne > food borne).

Special features :

- Most cases are asymptomatic.
- Self-limiting disease in most adults.
- Pregnant females: may lead to fulminant hepatitis.
- Diagnosis : IgM/ IgG anti HEV antibody.

Immunity, prevention and control strategy : Improve water quality.

SOIL TRANSMITTED HELMINTHIC INFECTIONS

- Ascariasis.
- Hookworm (Necator americanus, Ankylostoma duodenale).
- Whipworm.

Ascariasis lumbricoides

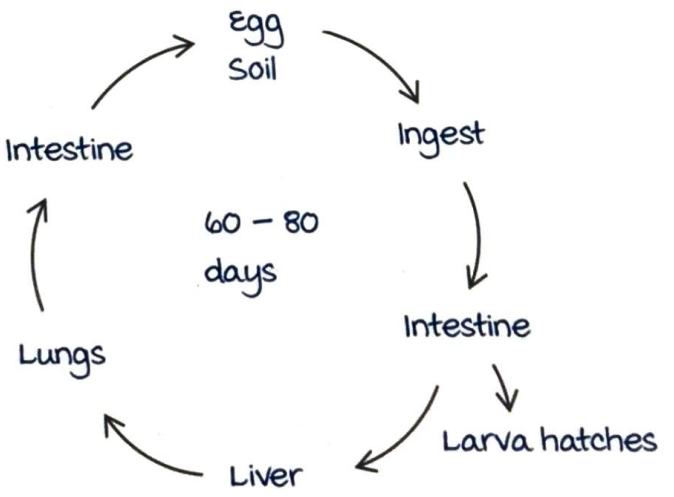
00:01:26

Reservoir : Human.

Source : Soil containing infective form of the egg.

Life cycle :

- In soil, eggs become infective in 2-3 weeks.
- After ingestion, eggs multiply in villi of intestines.
- Larva migrans : Larvae multiply in lungs causing pulmonary symptoms (Cough, eosinophilia).
- Larva is coughed up from lungs and re-swallowed into intestine.
- In intestine larva matures into male and female (lays eggs) forms.



Features of worm :

- Male : 15 – 30 cm long.
- Female :
  20– 35 cm long.
  Lays 2 – 3.5 lakh eggs / day.

Active space

Type and environment of soil :

- Hard, clay soil.
- Temperature :
  Optimum : > 20° C.
  Embryonation of eggs inhibited at : < 16° C.

Incubation period (IP) : 18 days – weeks.

Communicability :

- Infective material : Infective form of egg.
- Person is infective till all fertile female worms are present.

Special features :

- Clay soil.
- It becomes a public health problem when there is heavy contamination : > 50,000 eggs/gm stool.

Hookworms

00:08:06

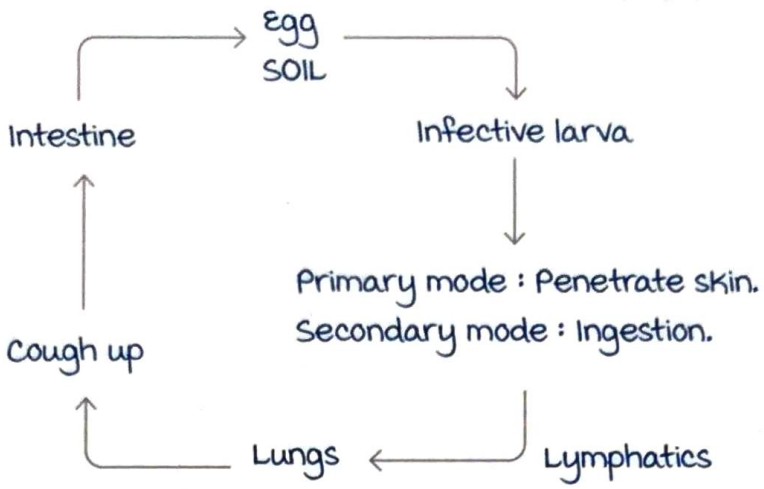
- Necator americanus.
- Ankylostoma duodenale.

Reservoir : Human.

Source : Soil.

Life cycle :

- In soil, eggs hatch in 1–2 days.
- Larva requires 5 – 10 days to attain infective form.
- Infective form : Infective larva.
- From egg to infective form of larva : 7 – 10 days (minimum 5 days).
- Lymphatic stage may be associated with prepatent period :
  Necator americanus : < 7 weeks.
  Ankylostoma duodenale : 5 weeks – 9 months.
- Mature into male and female forms in intestine.



Length of worm :

- Male : 8 – 11 mm.
- Female : 10 – 13 mm.

Number of eggs laid :

- Necator americanus : 5 – 10,000 eggs / day.
- Ankylostoma duodenale : 10 – 30,000 eggs / day.

Hookworms have a dorsal curved anterior end.

Environmental factors :

- Temperature :
  Optimum : 24°C – 32°C
  Inhibitory to larval formation at < 13°C and > 45°C.
- Rainfall : > 100 cm promotes larval formation.
- Soil : Soft, porous, sandy soil.

Incubation period, communicability and special features of Hookworm

00:15:02

Incubation period :

- Prepatent period :
  Ankylostoma duodenale : 5 weeks – 9 months.
  Necator americanus : Around 7 weeks.
- Extrinsic IP : > 5 days till 7 – 10 days.

Communicability :

- As long as person harbours fertile female worms.
- As long as stools contain eggs.

Special features :

- Chandler's index :

Active space

Eggs / gm of stool	Public health problem
< 200	No public health problem
200 – 250	Mild public health problem
250 – 300	Moderate public health problem
> 300	Severe public health problem

- Hookworm is the most common cause of soil transmitted helminthic infections leading to chronic blood loss and anaemia.
- It may increase prevalence of anaemia in community.
- Loss of plasma in intestinal lumen may lead to hypoalbuminemia.

Immunity, prevention and control of helminthic infections

00:18:53

60c6b3eeaa8ded0e4e7e5ea7

Prevention :

Primary prevention :

- Improve sanitation, decrease outdoor defecation.
- Provide safe water supply.

Secondary prevention : Early diagnosis and prompt treatment.

Treatment :

Drug of choice : Albendazole

- Dose : 400 mg single tablet.
- Given as biannual dose under national health programme.
- For age > 2 years.

Mebendazole : 100 mg in 2 divided doses for 3 days.

Levamisole :

- Most efficient for control of soil transmitted helminthic infections.
- Dose : 2.5 mg /Kg body weight (maximum : 150mg).

Pyrantel.

National deworming programme : Held on 10th February and 10th August every year. Albendazole given for ages 1 – 19 years.

mass chemoprophylaxis/treatment :

- Children 1 – 2 years : 200mg (1/2 tablet).
- 2 – 19 years : 400 mg.

Salient features of Ascariasis and Hookworm 00:22:49

Ascariasis	Hookworm
15 – 30 cm long.	0 8 – 13 mm long.
2-3.5 lakh eggs / day.	5 – 30000 eggs / day.
Hard soil.	Soft soil.
Embryonation inhibited at : < 16°C.	Larval formation inhibited at : < 13°C.
Life span : 1 – 1.5 years.	Life span : 1 – 4 years.
Most common soil transmitted helminthic infection.	Most common soil transmitted helminthic infection associated with anaemia.
Eggs are infective.	Larvae are infective.
Extrinsic IP : 2 – 3 weeks.	Extrinsic IP : 5 – 10 days.

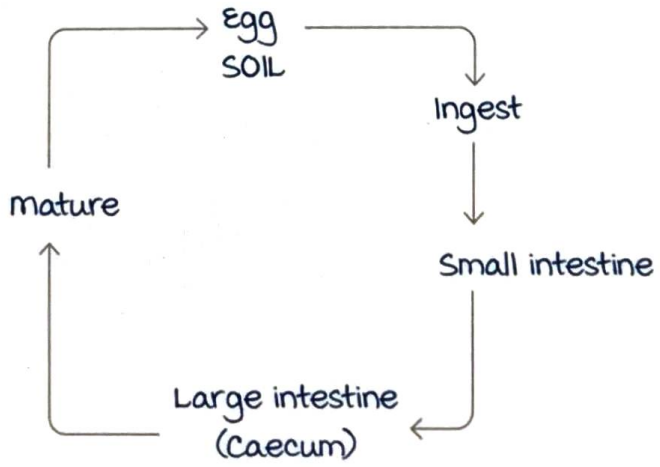
Whipworm 00:25:15

Whipworm is the 3rd most common soil transmitted helminthic infection.

It infects and resides in the large intestine (Caecum).

Life cycle :

- Eggs become infective in 14 – 21 days and are directly ingested.
- Eggs hatch in small intestinal villi.
- Larvae attach and develop in large intestine. (Caecum).



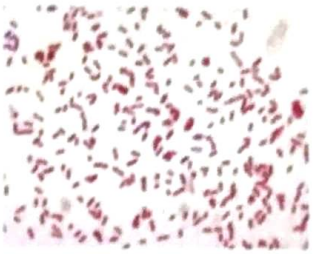
Features of whipworm :

- Male/ female : 30 [illegible]e4e7e5ea7
- Female lays 200 – 10,000 eggs / day.
- Whipworm may be a leading cause for dysentery, chronic diarrhoea (Females and young children).

Active space

PLAGUE, YELLOW FEVER, KFD

Plague : Epidemiological determinants 00:00:47



Agent factors : Yersinia pestis,

- Gram negative.
- Non motile.
- Coccobacillus.
- It shows bipolar staining (specific stain : Wayson stain).
- It is also stained by Giemsa stain.

Reservoir : Wild rodents

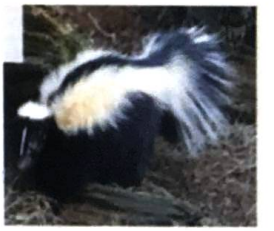
- mice.
- Field rats.
- Gerbil (Tatera indica) (AKA : Indian desert gerbil) : It is the most commonly associated reservoir and transmission of plague in India.
- Skunks : Not common in India.

Domestic rats (Rattus rattus), is not involved in plague epidemicity or endemicity in India.

60c6b3eeaa8ded0e4e7e5ea7

Indian desert gerbil

Field rat



Skunk

Source : Humans – Case of a Pneumonic Plague and rat flea (Xenopsylla cheopis).

Host factors : Plague is a zoonotic disease and one of the oldest disease known to mankind (AKA black death, during WW2). Associated with host factors like :

- Overcrowding.
- Travelling.
- Unhygienic conditions.

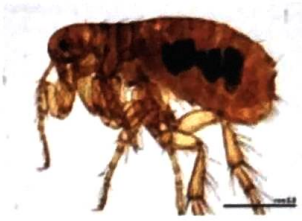
Case fatality rate (CFR) of untreated cases : 50–100%.

Active space

Environmental factors : Has got a seasonal trend, spreads more during September to May (more transmission is seen in winter seasons).
Optimum temperature : 16–24°C.
Relative humidity of > 60% promotes the transmission of plague.

Plague : Incubation period, mode of transmission

00:06:20



Based on the type of plague :

- Pneumonic plague : 1–3 days.
- Bubonic plague : 2–7 days.
- Septicemic plague : 2–7 days.

Modes of transmission :
Vector : Xenopsylla cheopis/rat flea (most important),
Pulex irritans/human flea.
It is a blood feeding arthropod which can ingest approx. 0.5 cu mm of blood at one time from rats and humans.
1 meal of 0.5 cumm of blood from rats : 5000 plague bacilli.

Plague bacilli shows propagative transmission (increases in numbers, not in shape) inside the stomach of a rat flea.

↓

Increased replication (change in the number of viruses) of plague bacilli inside the rat flea.

↓

This flea is now called a blocked flea (plague primarily is spread by these blocked fleas)

↓ Blocked flea gets violent/ferocious.

So it bites dogs/horses/cats/humans instead.

↓

Plague is transmitted to humans.
Plague is also transmitted to humans via partially blocked rat flea (more dangerous, because of its longer lifespan).

Plague : Vector indices

00:13:00

1. Total flea index : Total number of fleas per rat.
2. Cheopis index : Total number of xenopsylla cheopis per rat.
   It is the most sensitive vector index for plague.
   Increased plague transmission in a particular area leads to increase in the cheopis index because of the increased death of the rats.
   Death/fall of rats is considered as the earliest sign of upcoming plague outbreaks.
3. Specific percentage of flea : Total number of specific flea to the total number of fleas.
4. Burrow index : Total number of fleas which are present per rodent burrow.

One flea can keep the plague bacilli for approximately 4–5 years.
Rat fleas can stay inside the rodent burrows for 3–4 years.

Plague : Clinical types

00:17:34

Bubonic plague (Bubo : Lymph glands) :
most common.

Flea usually bites the lower limbs, from where the viruses travel to the regional lymph nodes and starts replicating.
This leads to the formation of bubos (large swollen lymph glands) mostly in the groin region and lower limbs.
Person-to-person transmission is absent.

Pneumonic plague :
It is a rare complication of bubonic plague (< 1%).
Plague bacilli are found in the sputum.
more severe type of plague and is of public health importance.
Person-to-person transmission takes place.
Patients have to be strictly isolated to prevent further transmission.

Septicemic plague :
Characterised by the presence of plague bacilli in the blood.
It is the rarest and a very severe type with CFR of 30–80%.

Diagnosis of plague :
Based on the examination of the plague bacilli by staining methods (Wayson/giemsa stains).
Direct blood culture (gold standard method) is used for confirmation of the diagnosis.

Management and control of the plague epidemic

00:21:28

Early diagnosis of the disease in the susceptible population and household contacts.
Notification of the disease as it comes under International Health Regulation (IHR).
Diseases which come under IHR : (Mnemonic : CYPIPC)
Cholera
Yellow fever
Plague
Influenza
Poliomyelitis
Covid-19 disease.
Mandatory isolation of the patient for > 7-10 days.

Treatment :
DOC : Streptomycin 30 mg/kg body weight, IM, BD for 7-10 days. Alternate drug : Tetracycline.

Vector control in Plague :
Insecticides used :

- DDT (Not preferred because of its toxicity and resistance).
- BHC 3%.
- Carbaryl 2%.
- Malathion 5%. Most commonly used and most effective insecticide. It is sprayed in all the rat burrows which are around the radius of 8-10 Kilometres.
  Total flea index drops to < 1 within 48 hours of spraying malathion.

Prophylaxis and prevention of plague:
Chemoprophylaxis :
DOC : Tetracycline 500 mg 6th hourly for 5 days.
Vaccine prophylaxis : Sokhey modified Haffikine vaccine (not effective in outbreaks).

- Given in 2 doses with a gap of 1-2 weeks, 1st dose of 0.5 ml, 2nd dose of 1 ml.
- Immunity develops in around 5-7 days.
- Usually used in emporiatrics(science of travel medicine). (Vaccine is used in travellers and health professionals who are going into the plague infested areas).

Yellow fever

00:28:58

It is a disease under International Health Regulation (IHR).
Prevalent in Africa and South America.
It is an exotic disease in India.
Case fatality rate : 50-80% in untreated patients within 5-10 days.

Epidemiological determinants :
Agent factors: It is an arboviral disease, virus flavivirus fibricus (Togaviridae family), meta-zoonotic disease (agent present in animal crosses through the arthropods to reach humans).
Reservoir : Primates (chimpanzees, monkeys, humans and also mosquitoes).

Source/vector : Aedes aegypti (mc) > Aedes albopictus.
Host factors : Affects all age groups and genders.
Affects people in high-risk occupations like people working in forest areas and those who are working with wild animals.

Natural infection will cause a lifelong immunity.

Environmental factors : Hot and humid conditions.

- Temperature of > 24°C.
- Relative humidity > 60%.

Mode of transmission :

Sylvatic cycle/jungle cycle : mosquito to monkey to mosquito cycle.

Intermediate cycle (causes outbreaks) : mosquito to monkey and humans contract the disease from same mosquito

Urban cycle (only causes sporadic infections) : Human to mosquito to human cycle.

Incubation period of yellow fever : 3-6 days.

Extrinsic incubation period (in the mosquito) : 8-12 days.

Trans-ovarian transmission takes place in the mosquito.

Diagnosis : Serology (specific IgM for yellow fever).

Confirmatory test : RT-PCR test.

No specific treatment available, only symptomatic treatment.

Prevention of yellow fever : Vaccine 00:37:30

17-D strain vaccine.

It is a live attenuated, freeze-dried vaccine given with diluent.

Dose : 0.5 ml SC in deltoid region.

Storage conditions : +5 to -30°C (preferably < 0°C).

It should be used within 30 mins after reconstitution.

Immunity develops after 5-7 days of vaccination and will last lifelong.

Contraindications of the vaccine :

- Pregnancy (teratogenic), but, in cases of urgent travel/ outbreaks, pregnancy is overruled.
- Egg allergy.
- Age < 6 months.
- HIV/severe immunosuppression.

Vector control :

Vector : Aedes aegypti.

Aedes aegypti index (AAI) : Total number of houses with Aedes larvae within 400 m of any seaport/airport of international connections (double the flight range of aedes).

Flight range of Aedes is 100-200 metres.

AAI is maintained < 1 to control the outbreak of yellow fever in an exotic country.

Elimination of Yellow fever Epidemic strategy (EYE strategy) :
Vaccine requirement for International travellers has been mandated by WHO.
Vaccine certificate is valid from 10th day after vaccination till the entire lifetime.
60c6b3eeaa8ded0e4e7e5ea7
To protect the persons at risk.
To prevent the International spread of yellow fever.
In case of an outbreak, to control it.

Kyasanur Forest Disease (KFD)

00:46:46

1ST reported in 1957 in Shimoga district of Karnataka.
Was previously known as monkey disease, because of its relation to monkey deaths.

Epidemiological factors :
Agent factors : KFD virus (Group B Togaviridae family).
Reservoir : Small wild mammals like rodents and squirrels.
Amplifying host : monkeys.

Source : Hard tick or soft tick (Haemophysalis turtura, Haemophysalis spinigera).
Tick supply : Cattle, horses.
Host factors : Related to forest work.

Mode of transmission :
Infective stage : Bite of the larval stage of the tick.
Incubation period : 3–8 days.

Clinical features

00:51:46

Early stage : Fever, GI complaints (nausea, vomiting, diarrhea).

2nd stage : Haemorrhagic manifestations (bleeding from nose and mouth).

Active space

Afebrile phase for 2-3 weeks followed by severe meningoencephalitic phase.
CFR : 5-10%.

Prevention and control :
No specific treatment available.
Intense spray with malathion 5-10 %/BHC 3-5%, upto 50 metres of any monkey death.

Restriction of cattle in the area around monkey death.
Health education for the forest workers.
Use of personal protective measures like DEET (Diethyl Toluamide), DMP (Dimethyl phalate).

60c6b3eeaa8ded0e4e7e5ea7

ZOONOSES AND RABIES

60c6b3eeaa8ded0e4e7e5ea7

Types of zoonoses

00:00:43

1. Direct zoonoses.
2. Cyclo zoonoses.
3. Meta zoonoses.
4. Sapro zoonoses.

Direct zoonoses :

- Animals (vertebrate) ⟶ human (vertebrate).
- No change in development/replication.
- Eg : Rabies, Brucellosis.

Cyclo zoonoses :

- Vertebrate source ⟶ Another vertebrate ⟶ host (human).
- It requires 2 or more vertebrate hosts for development/multiplication.
- Eg : Taeniasis (cattle, pig), Echinococcus (dog, sheep).

Meta zoonoses :

- Vertebrate source ⟶ Invertebrate (vector) ⟶ host (human).
- In vector, there may be
    1. Propagation (increase in number).
    2. Cyclical change : Cyclo development (change in shape).
    3. Both : Cyclopropagation (change in shape & number).
- Eg : Arboviral, plague, schistosomiasis.

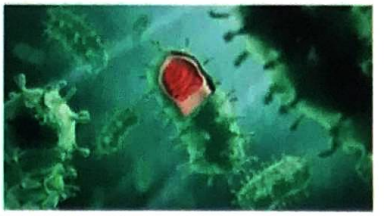
Sapro zoonoses :

- Vertebrate (animal) source ⟶ non animal source ⟶ host (human).
- Non animal source: Non-living material/reservoir, plants, soil.
- Eg : mycoses, larva migrans.

Active space

Rabies :

- Direct zoonotic disease.
- 100% fatal : no cure.



Rabies epidemiological determinants :

Agent :

- Lyssavirus-1 from Rhabdoviridae family.

Fixed virus	Street virus
Fixed incubation period.	Variable incubation period.
IP: 5-7days (6days).	IP : 7-10 days to months/ years.
Does not cause disease.	Causes rabies.
Does not have Negri bodies.	
Used in production of vaccines.	

Host :

- Age : Peak in 1-24 years.
- Occupation : Veterinary doctors, hunters, dog handlers, working in forest.

Animal bites

00:11:18

In India :

- Bats and rodents do not cause rabies : No need to give rabies vaccination.
- Dog/cat/ monkey/wild animal bites : Major source of rabies.

60c6b3eeaa8ded0e4e7e5ea7

Animal bite classification :

Class I	Licks, touch (on intact skin).	Wound management.
Class II	Minor abrasions/ lacerations (Skin integrity is broken).	Anti rabies vaccine (ARV)
Class III	Blood oozing, licks on mucosa, deep tissue injury, all wild animal bites.	ARV + Rabies Immunoglobulin (RIG)

Wound management :

Physical : Wash with ample soap + running water (15-20 min).

Chemical : Alcohol based antiseptics, povidone iodine.

Biological : Irrigate the wound with RIG. Give TT vaccine/ARV.
For deep injury : Delayed suturing, loose/minimum sutures.

Anti rabies vaccine :

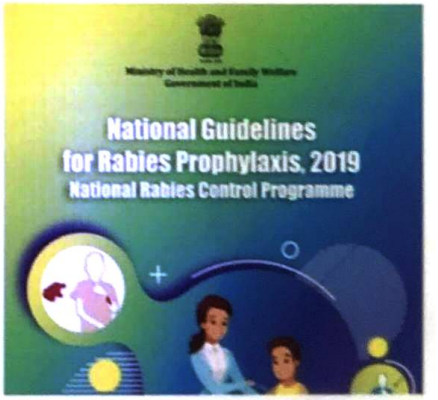
- Type : Cell culture vaccine. HDCV (Human Diploid Cell culture Vaccine) has the best immune response.
  Neural tissue vaccine (NTV) : Obsolete.
- Dose : > 2.5 IU of inactivated rabies vaccine (i.m.).
- Dose to be administered :
  1. Intramuscular : Complete vial.
  2. Intradermal : 0.1 ml.
- Freeze dried vaccine containing inactivated rabies virus (diluted & then injected).
- Shelf life : 1-3 years at 2-8°C
- Reconstituted vaccine : Use it within 6 hours.

Regimes :

Pre exposure prophylaxis	Primary prevention
Post exposure prophylaxis	Primary prevention
Re-exposure prophylaxis	Primary prevention

Every type of prophylaxis is primary prevention.

National Rabies Control Program (NRCP 2019) 00:25:14



Pre exposure prophylaxis :

- 3 doses (intradermal/ intramuscular),3 visits.
- Days : 0, 7, day 21 /28.

Post exposure prophylaxis :

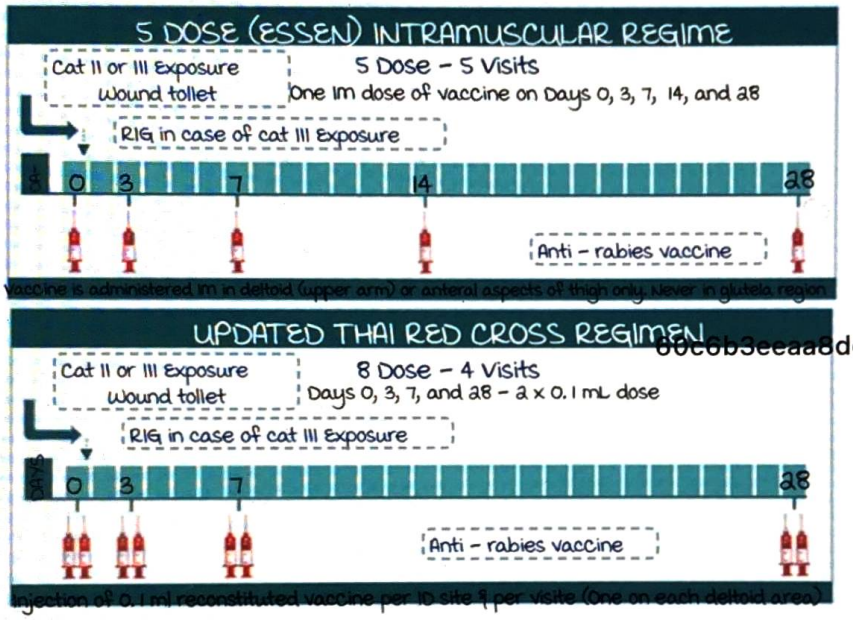
Essen schedule :

- Intramuscular in deltoid.
- Never gluteal (fat decreases efficacy).
- In children : Anterolateral thigh is preferred.
- 5 visits : 1 dose i/m every visit.
- Days : 0, 3, 7, 14, 28

Modified Thai red cross schedule :

- Intradermal.
- 4 visits : 2 i/d (at 2 sites) every visit.
- 4 visits : 8 doses.
- Days : 0, 3, 7, 28.

Essen	Modified Thai redcross
Intramuscular	Intradermal
5 visits : 0, 3, 7, 14, 28.	4 visits : 0, 3, 7, 28.
5 doses	8 doses



Re-exposure prophylaxis :

- Given in all previous rabies vaccinated individuals.

Regime :

- i/m or i/d.
- 2 doses, 2 visits.
- Days : 0, 3.
- No requirement of RIG in re exposure prophylaxis.

Eligibility criteria for re-exposure prophylaxis :

- In all cases with documented pre-exposure prophylaxis (3 doses) : All cases, anytime.
- In case of post exposure prophylaxis (5 or 8 doses) :
  1. <3 months : Wound management.
  2. >3 months : Re exposure prophylaxis.

Active space

Summary :

	Visits	Days
Re-exposure prophylaxis	2	0,3
Pre exposure prophylaxis	3	0, 7, 21 /28
Thai red cross	4 (8 doses)	0, 3, 7, 28 (2 doses each)
Essen	5 (5 doses)	0, 3, 7, 14, 28

The summary of vaccination schedule as per route is as under :-

Type of Prophylaxis	Route of Administration	Dose of vaccine	Day of Dose	No. of injections	Total No. Per visit	Site of Injection Visite
Post Exposure Prophylaxis	Intra Dermal	0.1 ml per dose	Day 0, 3, 7 and 28	2	4	Adults : Deltoid muscle
	Intra Muscular	1 entire vaccine vial	Day 0, 3, 7, 14 and 28	1	5	
pre Exposure prophylaxis	Intra Dermal	0.1 ml per dose	Day 0, 7, and booster on either day 21 or 28	1	3	Infants and small Children : Anterolateral Thigh
	Intra Muscular	1 entire vaccine vial	Day 0, 7, and booster on either day 21 or 28	1	3	
Re-exposure	Intra Dermal	0.1 ml per dose	Day 0 & 3	1	2	
	Intra Muscular	1 entire vaccine vial	Day 0 & 3	1	2	

Rabies Immunoglobulin

00:38:34

- Types :
  1. Equine RIG (ERIG) : 40 IU/Kg
  2. Human RIG (HRIG) : 20 IU/Kg : Less side effects, better immunity.
- Given only in case of all class III animal bites.
- To immuno compromised/ HIV patients : Class II & class III bites.

- Maximum amount to be infiltrated in or around the wound.
  Caution : Should not lead to compartment syndrome.
- Remaining to be given at i/m site near to the wound.
- It is not repeated in the re-exposure prophylaxis.

Rabies vaccine :

- In case of immunocompromised/ HIV :
  1. i/m > i/d (i/m has better efficacy).
  2. RIG for class II & III bites.
- In case of COVID :
  1. Rabies vaccine is given on priority.
  2. In case of covid vaccinated : i/m > i/d.
- Pregnancy :
  1. Rabies vaccine given.
  2. High chances of miscarriage/ fetal loss.
- Malaria & on treatment :
  i/m > i/d.
- If patient completes pre-exposure prophylaxis,
  1. Follow up is done by vaccine neutralizing antibodies.
  2. If > 0.5 IU/ml : No booster dose needed.
  3. After 2-3 years : Booster may be given in high risk population (forest officers).
- Domestic animal bites :
  1. If dog has documented anti-rabies vaccine schedule : No vaccine needed.
  2. Always give ARV in case of doubt.

Dog observation

00:48:13

- The dog /cat should be observed for 10 days.
- If the dog is alive on day 10, day 14th dose can be omitted, next dose can be given directly on day 28 (0, 3, 7, 28 : 4 doses).

TETANUS

Tetanus – introduction 00:00:07

Bacteria : Clostridium tetani.
Gram positive, anaerobic.
Drumstick shaped.
Spore forming :

- Spores resistant to → Boiling, Phenol, Cresol
- Spores sensitive to → Autoclave at 121°C for 20 minutes.

60c6b3eeaa8ded0e4e7e5ea7

Toxin : Tetanolysin.
Tetanospasmin : most potent toxin.
Blocks presynaptic inhibitory neurotransmitter release

↓
Leads to unopposed muscle contraction
↓
Causes locked jaw, opisthotonos.

Neonatal tetanus/ Tetanus neonatorum :
It is called as 8th day disease.
It is a disease of public health importance.
Causes : Infection from mother.
Infected umbilical stump.

Epidemiology :
Reservoir & source : soil.
Mode of transmission : Soil/ inoculation or direct contact.
Incubation period : 6 – 10 days to weeks/months.

Active space

Tetanus prevention 00:04:30

Immunization

- Active
  - Tetanus toxoid vaccine
    - DPT
    - PV [pentavalent]
- Passive
  - Human tetanus immunoglobulin.
    - Given at 250 IU to all ages.
    - Lifespan of 30days.

Vaccine schedule under mission Indradhanush :

Three primary doses + 3 to 4 booster doses are given.

PV	Booster 1	Booster 2	Booster 3	Booster 4
	[DPT]	[DPT]	[Td]	[Td]
6, 10, 14 weeks	+ 16 to 24 months	+ 5 to 6 years	+ 10 years	+ 16 years

Recommended TT vaccine schedule :

Two primary doses +/- 1 or 2 booster doses.

Given with a gap of 4–6 weeks usually.

At 0, 1 & 2 months : Primary doses.

At 1 year : 1st booster dose.

At 5 years : 2nd booster dose.

TT vaccine : In trauma cases.

Td vaccine : NIS (National immunization schedule) - Children & pregnant mothers.

60c6b3eeaa8ded0e4e7e5ea7

Vaccine schedule for tetanus prevention 00:08:48

Based on category of patient :

A. Full immunization done within < 5years.

B. Full immunization done in 5 to 10 years.

C. Full immunization done within >10 years.

D. Unknown, never taken TT.

Category	Clean wound	Unclean wound
A	Wound care	Wound care
B	Wound care + 1 dose TT	Wound care + 1 dose TT
C	Wound care + 1 dose TT	1 dose of TT + TIg [immunoglobulin]
D	Complete TT schedule	Complete TT schedule + T Ig

Tetanus prevention

00:12:23

India has achieved neonatal tetanus elimination in August/ September 2015.
According to WHO neonatal tetanus elimination : If < 1/1000 live births.

District categorization for neonatal tetanus (NT) :

	NT incidence per 1000 live birth		Complete TT coverage [2 or more doses]		Clean delivery
NT high risk areas	> 1	OR	< 70%	OR	< 50%
NT control areas	< 1	and	> 70%	and	> 50%
NT elimination areas	< 0.1	and	> 90%	and	> 75%

RICKETTSIA

- Gram negative.
- Non spore forming.
- Pleomorphic.
- Obligate intracellular.

Organism	Disease	Arthropod vector	Vertebrate reservoir	Clinical severity	Geographic Distribution
Spotted fevers					
R. rickettsii	Rocky mountain spotted fever	Tick	Dogs	+	Rocky mountain states, Eastern USA
R akari	Rickettsial pox	mite	mice	-	Asia, Far East, Africa, USA
R conorii	mediterranean spotted fever	Tick	Dogs	+	mediterranean
Typhus					
R. Prowazekii	Epidemic typhus	Louse	Humans	++	Africa, South [redacted]
R. typhi	Endemic typhus	Flea	Rodents	-	Worldwide
Orientia Tsutsugamushi	Scrub typhus	mite	Rodents	++	FarEast
Others					
Coxiella burnetti	Q fever	None	Sheep, goats, cattle	+	Worldwide
Bartonella quintana	Trench fever	Louse	Humans	+	Asia, Africa, Central & South America
Ehrlichia chaffeensis	Fever (ehrichiosis)	Tick			USA, Japan (Esennetsu)

4 more common infections in india : Endemic /murine typhus.
Scrub typhus.
Q - fever.
Indian tick typhus.

The only flea borne rickettsial disease : Endemic typhus.

The only non - vector borne rickettsial disease : Q - fever.

Rickettsial disease with human as reservoir :

Trench fever > Epidemic typhus.

Scrub Typhus

00:06:13

m/c in South East Asian countries (India, Bangladesh), China, Russia.

Causative agent : Orientia tsutsugamushi (previously K/a Rickettsia tsutsugamushi).

Mode of transmission (MOT) : Trombiculid mite.

Life cycle : Rat ⟷ mite ⟷ Rat
↓
man (accidental host)

Incubation period : 10 - 14 days.

Clinical features : Fever.
Rash : 5th - 7th day of fever.
Eschar(black spot near the bite of mite).
Generalised lymphadenopathy.

Investigation : Weil Felix reaction.

Treatment : Tetracycline, Doxycycline.

Endemic / Murine Typhus

00:09:57

m/c in South Asia, East Asia, West Pacific.

Causative agent : R. typhi

Mode of Transmission : Rats - reservoir.
Vector - flea > louse.

Life cycle : Rat ⟷ flea ⟷ rat
↓
man (accidental host)

Incubation period : 7 - 14 days.

Clinical features : Fever with rash.
It is a mild disease & self-limiting.

Diagnosis : Serology
Weil Felix reaction (proteus OX - 19 antigen).
Treatment : Doxycycline, Tetracycline.

Q - Fever 00:13:17

m/c in rural and agricultural areas.
Causative agent : Coxiella burnetti.
Mode of transmission : Direct contact.
Airborne (inhalations).
Ingestion.
Incubation period : 2 - 3 weeks.
Q - fever is the only disease with no arthropod vector and no rash among the rickettsial disease.
Clinical features : Fever, features resembling influenza.
Complications : Pneumonia like picture, respiratory distress, 2° infection.
Diagnosis : Serology.
Treatment : Doxycycline.

Indian Tick Typhus 00:15:56

m/c in South Asia and South East Asia.
Causative agent : R. conorii.
Mode of Transmission : Vector - tick (Hard > soft tick)
Reservoir - Dog.
Life cycle : Dog ⟷ Tick ⟷ man.
Incubation period : 2-7 days.
Clinical features : High grade fever with rash on 3rd-4th day.
Treatment : Doxycycline / Tetracycline.

Rash producing disease 00:18:41

- Meningococcal rash : Pink , maculopapular rash (tender to touch).
- Rubella : Rash associated with lymphadenopathy (epecially cervical).
- Rubeola : Rash spreads from face ⟶ Trunk ⟶ Arms.

- Epidemic typhus : Rash starts from axillary folds (Spares palms and soles).
- Scrub typhus : Maculopapular rash with eschar formation and lymphadenopathy.
- Rickettsial pox : Vesicular rash.
- Rocky mountain spotted fever : Rash spreads from ⟶ Extremities ⟶ Trunk / face ⟶ Palms and soles.
  ± Vasculitis, if present is a characteristic feature.

EBOLA, ZIKA AND NIPAH

Ebola

00:00:17

From Filoviridae family.

Source factors : Ebola
Tai
Reston
} most common serotypes
Bundibugyo
Bombali : Not known to cause human disease.

Reservoir : Bats, wild animals.

Incubation period : 2- 21 days.

Mode of transmission : Body secretions (urine, faeces, sweat, blood, seminal secretions).
Objects.
60c6b3eeaa8ded0e4e7e5e87 bite.
Sexual route.
Vaginal secretions are not known to transmit Ebola.

Special features :

- 2020 : 11th outbreak of Ebola virus in Democratic Republic of Congo.
- The outbreak is declared as over if no case of Ebola has been reported in > 42 days.
- CFR : 50- 60%

Clinical features :

Nausea/ vomiting → Diarrhea → Pneumonia like picture →
Septicemia → Renal failure (MC cause of death), liver failure.

Immunity : Viral vector vaccine (VVV) : Ervebo/ Zabdeno.
Efficacy : 97.5%

Treatment : Monoclonal antibodies like Remdesivir, mAb114, Zmapp (under trial).

Active space

Zika

00:05:35

Anthropozoonotic infection.

SS RNA Flavivirus.

Source : Vector – Aedes ⟶ Albopictus.
↓
Aegypti (most common).

Reservoir : Unknown.

Incubation period : Few days (5 – 15).

Mode of transmission : Vector.
Perinatal.

Special features :

- 80% asymptomatic.
- Mild, self-limiting disease.
- Clinical feature : Maculopapular rash ± arthralgia + fever.
- Complication : Microcephaly ± GBS (seen commonly in children with high viral load /immunocompromised children).
- Diagnosis : RTPCR.

Immunity, prevention and control :

- Vector control, larval surveillance.
- Treatment : IV fluids and symptomatic control.

Nipah

00:10:02

Paramyxoviridae family.

Named after a small town, Nipah in Malaysia where it was first diagnosed & isolated.

2018 : Nipah outbreak in Kerala.

60c6b3eeaa8ded0e4e7e5ea7

Reservoir : Fruit bat (Genus : Pteropus)

- May transmit the disease.
- Do not suffer from the disease.

Incubation period : 4– 14 days.

Mode of transmission : Direct contact – Pigs (amplifying host).
Bat bite.
Infected humans.
Consumption of infected fruits : Raw date palm sap.

Special features :

- CFR : 40 – 80%
- Mild cases : Pneumonia like picture.
- Severe cases : ARDS, Encephalitis } Long term neurological complications.
- Diagnosis : RTPCR.

Immunity, prevention and control :

- Non-specific control modality.
- Symptomatic treatment ± Ribavarin.
- Usage of PPEs help to decline the number of cases.

NON-COMMUNICABLE DISEASES

Non communicable disease (NCD) 00:00:58

- NCD can be infectious (e.g rheumatic heart disease) or non-infectious.
- Latent period : Time period from the entry of agent (onset of risk factors), till the onset of 1st sign/ symptom.
- Chronic NCD : Characterised by irreversible pathology and duration of > 3 months, according to WHO.
- WHO steps approach (to identify NCD) :
  a. Questionnaire assessment.
  b. Anthropometric measurement (physical examination).
  c. Lab investigations.

Coronary artery disease (CAD) 00:04:26

Prevention strategy :

1. Population strategy : Primordial prevention & specific prevention.
2. High risk strategy.
3. Secondary prevention.

Population strategy :

a. Primordial prevention :
   - Increase physical activity in school going children and adolescents.
   - Smoke free society.
   - Weight control.

b. Specific prevention :
   Dietary recommendation :
   - Fat intake : < 20%
   - Salt intake : < 5 gm/day
   - Dietary cholesterol : < 100 mg/1000 kcal/day

Total cholesterol : < 220 mg/dl

Total HDL : > 40 mg/dl

Total cholesterol : HDL - <3.5

- Alcohol & smoking should be avoided.

High risk strategy (primary level of prevention) :

- Quit smoking.
- Treatment for HTN.
- Treatment for dyslipidaemia, obesity, increased cholesterol.

Secondary level prevention (specialized prevention) :

- Angioplasty.
- Bypass surgery.
- Interventional cardiology.

Trials/Special studies

00:11:36

- Framingham heart study : Largest cohort study to check association of risk factors causing heart diseases.
- Monitoring trends & determinants in CVD : Formerly known as MONICA.
- Oslo heart study : Study about association of smoking and CAD.
- Stanford three community trial : Trial to study the effect of health education on CAD.
- North Karelia project : Primarily focused over the effect & association of smoking, HTN, and cholesterol on CAD.
- Multiple risk factor intervention trial (MRFIT) : Based on association of CAD with the assessment of serum cholesterol, diastolic HTN level cut off, pattern of smoking & type of cigarette.

Hypertension (HTN)

00:14:50

Major risk factor for CAD.

Prevalence : 15% in male & 11% in female (according to $NFHS_4$).

Classification (ESC/ESH 2018) :

(European Society of Cardiologists & European Society of Hypertension)

Category	Systolic BP		Diastolic BP
Optimal	<120	and	< 80
Normal	120–129	and/or	80–84
High norma	130–139	and/or	90–99
Grade I HTN	140–159	and/or	90–99
Grade 2 HTN	160–179	and/or	100–109
Grade 3 HTN	≥ 180	and/or	≥ 110
Isolated systolic HTN	≥ 140	and	≤ 90

Rule of halves :

- Out of all hypertensive population, only 50% are diagnosed.
- Out of all diagnosed hypertensive population, only 50% are treated.
- Out of all treated hypertensive population, only 50% comply to treatment & adequately treated.

Tracking of HTN :

- Low BP should essentially be kept under check.
- Tracking of HTN should be done essentially from school going children.
- Tracking of HTN is technically grouped under specific protection (high risk strategy) of prevention.

Prevention of HTN :

Primary prevention : Life style modifications, physical exercise, healthy diet.

Secondary prevention : Early diagnosis and its treatment.

Obesity

00:22:49

Indicators of obesity :

Quetelet index (BMI)	$\frac{\text{weight [kg]}}{\text{height [m}^2\text{]}}$
Ponderal index	$\frac{\text{height (cm)}}{\sqrt[3]{\text{weight(kg)}}}$
Broca index	Height (cm) − 100
Lorentz formula	Height (cm) − 100 − $\frac{\text{Height (cm)}}{\text{2(for male) or 4 (for female)}}$
Corpulence index	$\frac{\text{Actual weight}}{\text{Desired weight}}$ Shouldn't exceed 1.2

60c6b3eeaa8ded0e4e7e5ea7

BMI cut off values for adults

Category	BMI global	Asians/Indians
Underweight	< 18.5	< 18.5
Normal	18.5–24.9	18.5–22.9
Overweight (pre-obese)	25.0–29.9	23–24.9
Obese class I	30–34.9	25–29.9
Obese class II	35–39.9	≥ 30
Obese class III	≥ 40	

1. WHO. Obesity : Preventing and Managing Global Epidemic, 2000 (TRS 894).
2. WHO/IOTF/IASO (2000) The Asia-Pacific perspective :REdefining Obesity and its Treatment.

Other indicators of obesity :

Skin fold thickness :

- measured using Harpenden caliper.
- measured at 4 sites (subscapular, supra-iliac, mid-biceps & mid-triceps).
- Sum of all 4 sites measurements, > 50 (in females) & > 40 (in males) indicates obesity.

Waist circumference : > 102 (in male) and, > 88 (in female) indicates obesity.

In Indian population, waist circumference of > 90 in males

Active space

and > 80 in females is considered as high risk.
Waist-hip ratio : > 1 (in male) and, > 0.85 (in female) is classified as obesity.
Morbid obesity : When BMI crosses 40.
Super morbid obesity : BMI crosses more than 50.

Rheumatic heart disease (RHD) 00:30:31

RHD is an infectious disease with hypersensitive reaction.
Most common causative agent : Group A streptococci (serotype M).

Another agent implicated in causation is Coxsackie virus
Most common age group affected : 5 to 15 years.
Most common valvular involvement : Mitral valve (regurgitation & stenosis).
RHD is the most common cause of heart disease in 5-30 years old population.
Etiology : RHD is commonly associated with low environmental hygiene, over-crowding, poverty & low SES.
Drug of choice (for prevention & prophylaxis) : Benzathine benzyl penicillin.
Prevalence study for RHD : Done in age group of 6-14 years (best indicator to study RHD).
Prevalence of RHD : 5-7/1000 population.

Jai Vigyan Mission :
Program for the control of RHD/RF, launched by Govt. of India.

Objectives :

a. To do serosurveillance & find out epidemiological determinants for Group A streptococci & sore throat.
b. To establish registry for RHD/RF across the country.
c. To promote vaccine development.
d. To promote research & development and advanced studies for investigations & pathology of RHD/RF.

Active space

Cancer

00:36:32

most sensitive screening modality :

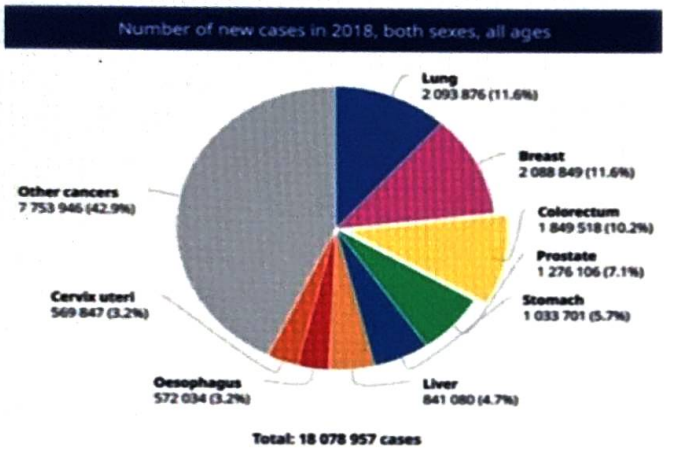
For Ca breast (in India) : Mammography.

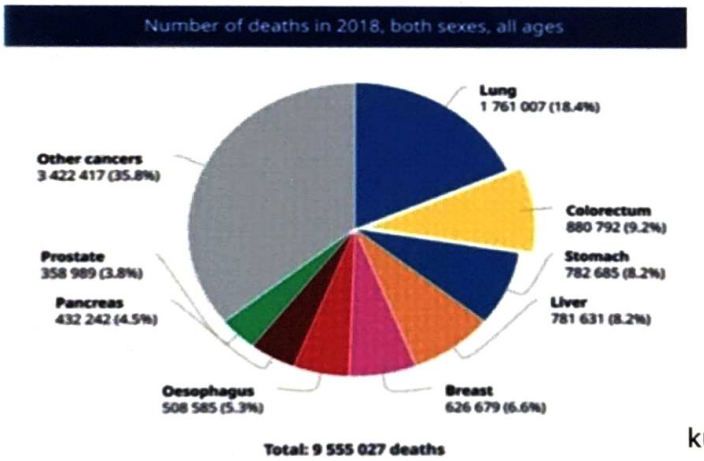
For Ca cervix (at PHC level) : Visual inspection method with acetic acid.

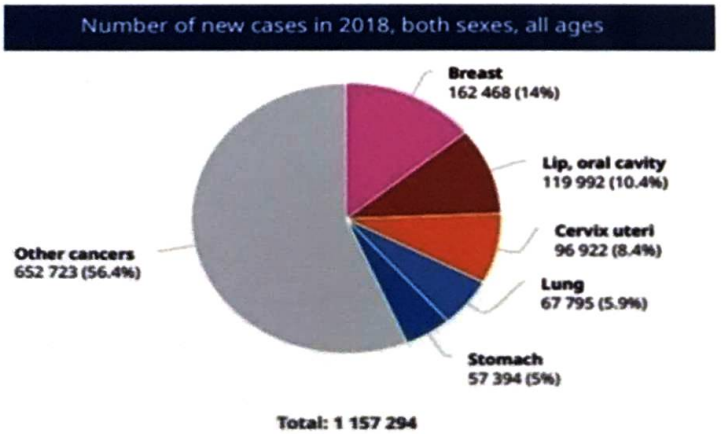
For Ca cervix (at CHC level) : PAP smear.

ICMR via National cancer registry program data : used in India.

Globocon (Global cancer observatory network) data : used by WHO globally.







Globally most common cancer (for both genders combined) :
Lung > breast > colorectal > prostate > stomach.
Most common cause of death due to cancer :
Lung > colorectal > stomach > liver > breast.

In India, (according to Globocon 2018), most common cancer :
Breast > lip/oral cavity > cervix uteri > lung > stomach.
In males, most common cancer : Lip/oral > lung > stomach.

According to National Cancer Registry Programme (NCRF), India (2020) :
Most common cancer in males : Lung > mouth > stomach > esophagus.
Most common cancer in females : Breast > cervix uteri.
This set of data is taken from the years 2012-2016, in 28 Population based cancer registry (PBCR) and 58 Hospital based cancer registry (HBCR).
Lavender coloured ribbon : Common colour for all cancers.
NCRF is formulated in 1981/1982.

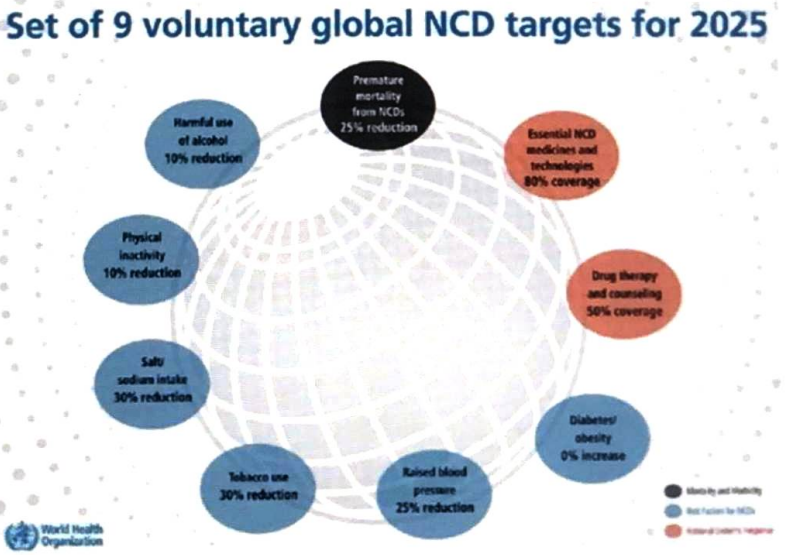
National health programmes related to NCD 00:46:48

60c6b3eeaa8ded0e4e7e5ea7

NP CDCS

National Programme for prevention & control of Cancer, Diabetes, CVDs and Stroke.

WHO's global framework for NCD :



- Max risk factors : Smoking and salt intake - to be reduced by 30%

Active space

- Other risk factors : Alcohol and less physical activity – to be reduced by 10%.
- Reduce premature deaths due to NCDs by 25%.
- Reduce HTN prevalence by 25%.
- Policy components :
    - 80% of community must have access to affordable medicines for all NCDs in all private and public centres.
    - > 50% of all patients must get access to drugs and medicines to prevent coronary artery disease an stroke.
- Halt the epidemic of obesity and diabetes.

Strategies under this programme :

Primary level :

- 1 nurse in each village for BP monitoring and identifying high risk population.
- Training of multpurpose workers for lifestyle modification & counselling for NCDs.
- GDM screening is done at below 12 weeks of pregnancy to prevent and treat early congenital anomalies due to hyperglycemia.
- Combining anemia and genetic diseases testing with n tional health programme (Anemia Mukt BHarat) and to be done at field level.
- Integrate RHD into RBSK programme (for 0–18 years).

a. National programme for burn injury prevention & management :

Burn units :

- Present at all district hospitals.
- 400 square meter/bed.
- 6 beds/100 bedded hospital.

Haddon matrix :

- Injury reduction strategy.
- Statistical measure to understand the cause of accidents (human cause, environmental cause, mechanical/technical cause).

NUTRITION : CONCEPTS AND MACRNUTRIENTS

Proximate principles

60c6b3eeaa8ded0e4e7e5ea7

00:03:01

Energy providing food products.

- Carbohydrates : 4 Kcal/g.
- Proteins : 4 Kcal/g.
- Fat : 9 Kcal/g.

Extra foods that give energy :

- Fiber : 2 Kcal/g (RDA : 40g/2000 Kcal).
- Alcohol : 7 Kcal/g.
- Water : Zero Kcal.

1 Kcal = 4.184 KJ

1 KJ = 0.239 Kcal

Dietary goals : Carbohydrates : 50 – 70%
Proteins : 10 – 20%
Fat : 20 – 30%

Diet

00:06:07

Prudent diet : A temporary diet that adheres to dietary goals.
Example : Post-op patient diet, renal diet, diabetic diet.

Balanced diet : A diet that contains all the nutrients (macro & micro) in required quantities, to prevent any excess/ deficiency.

Staple diet : It is a diet that is culturally acceptable, which is consumed by the majority of the population.

Food Adulteration 00:10:35

Food adulteration : Any substance added to a food product that harms the body or decreases the nutritive value.
Example : Brick powder in Chilli powder.
Water in Milk.

Food additive : Any substance added to a food product that does not alter the nutritive value but increases the shelf life or consumability.
Example : Artificial flavors/ preservatives in food products.

Food fortification : Any substance added to a food product that increases the nutritive value & does not belong to that food product initially.
Example : Addition of iodine to salt, Vitamin A & D in oil.

Food enrichment : Any substance added to a food product that increases the nutritive value & was present in the food in lower quantities initially.
Example : Iron-enriched biscuits.

Protein indicators 00:16:28

- Amino Acid Score (AAS) :

$$AAS = \frac{\text{Amount of amino acid in a food product}}{\text{Amount of same amino acid in the reference protein (egg)}} \times 100$$

- Net Protein Utilization (NPU) :
  Composite indicator (DC x BV)
  Combined indicator of external & internal protein quality indicator.
  NPU is maximum for Egg → (96-97).

$$\text{Digestibility coefficient (DC)} = \frac{\text{Amount of amino acid absorbed}}{\text{Amount of protein ingested}}$$

$$\text{Biological value (BV)} = \frac{\text{Amount of N2 retained}}{\text{Amount of amino acid absorbed}}$$

NPU = Digestibility coefficient x Biological value
(External indicator) (Internal indicator)

$$\text{NPU} = \frac{\text{Amount of N2 retained in the body for body mass functions}}{\text{Amount of protein ingested}}$$

- PDCAAS (Protein Digestibility Coefficient Corrected Amino Acid Score) : No longer used.

- DIAAS (Digestible Indispensable Amino Acid Score)
  Best indicator
  It determines the ileal digestibility coefficient of a food product.

DIAAS> NPU

- Protein-energy ratio (PE_nR)

$$PE_nR = \frac{\text{Amount of energy from the protein in food product}}{\text{Total energy from the food product}} \times 100$$

Highest PE_nR : Fish (80%)

- Protein Efficiency Ratio (PE_fR)

PE_fR = Amount of weight gain per unit of protein.

  - Laboratory indicator.

Limiting amino acids

00:33:30

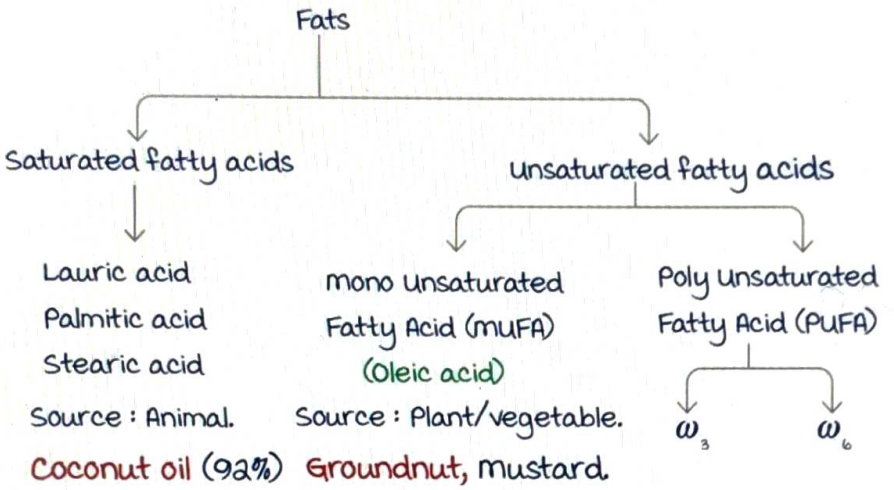
- Cereals : Deficient in threonine & lysine.
- Pulses : Deficient in cysteine & methionine.
- Maize : Deficient in tryptophan & lysine.
- Lysine is the most deficient amino acid in cereals.

Pellagra : Occurs due to deficiency of Niacin.

- Corn/maize is deficient in tryptophan & lysine.
- 60 mg of Tryptophan (precursor) → 1 mg of Niacin.
- maize contains a very high amount of Leucine → Inhibits Tryptophan to Niacin.
- Therefore, Leucinogenic food products also lead to Pellagra.

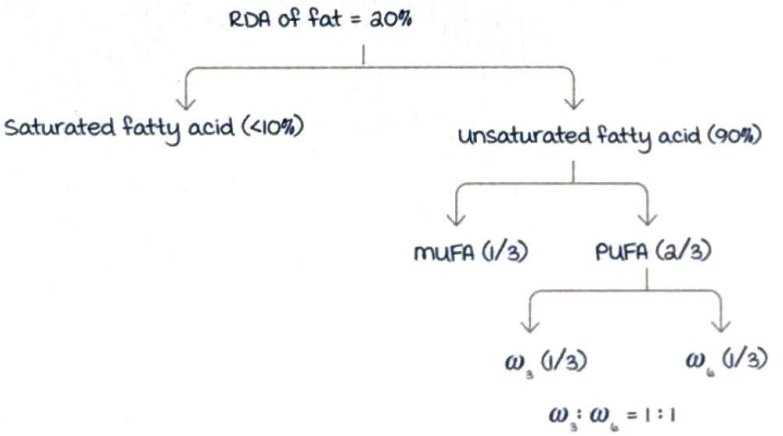
Fats

00:40:13



Saturated fatty acids have a single bond.
Unsaturated fatty acids have triple bonds.

	ω_3	ω_6
Name :	α - Linolenic acid	Linoleic acid
Source :	Flax seed	Safflower
Long-chain fatty acid derivatives :	Eicosapentanoic acid (EPA)	Arachidonic acid
Long-chain fatty acid derivatives sources :	Fish	Milk, egg.



Active space

Partially Hydrogenated Vegetable Oil (PHVO) 00:49:35

- Vanaspati ghee/ dalda ghee.
- Partial hydrogenation leads to the solidification of oil to fat.
- Uses : Easy storage & handling/ transport.
  Increases shelf life of the vegetable oil.
- It is fortified with : Vitamin A – 2500 IU/ 100ml of oil &
  Vitamin D – 175 IU/ 100ml of oil.

Phrynoderma :

- Deficiency of essential fatty acids.
- Toad skin.

Glycemic index 00:51:54

- Glycemic index (GI) is the rate of change of blood glucose per unit of food consumed.

High GI : Artificial Products, white bread, rice, cornflakes, ice-cream	Moderate GI : most fruits, dairy products, brown rice.	Low GI : (Natural foods, high fiber foods) vegetables, oats, quinoa, pulses, cereals, guava.
	All fruits have moderate to low GI.	

NUTRITION : MICRONUTRIENTS & RDA 2020

Micronutrients : Vitamins A, B and C 00:00:53

Hidden hunger

- Micronutrient deficiency .
- Most common cause : Iron deficiency.
- Among vitamins : Vitamin A deficiency.

60c6b3eeaa8ded0e4e7e5ea7

Vitamin A

Sources :

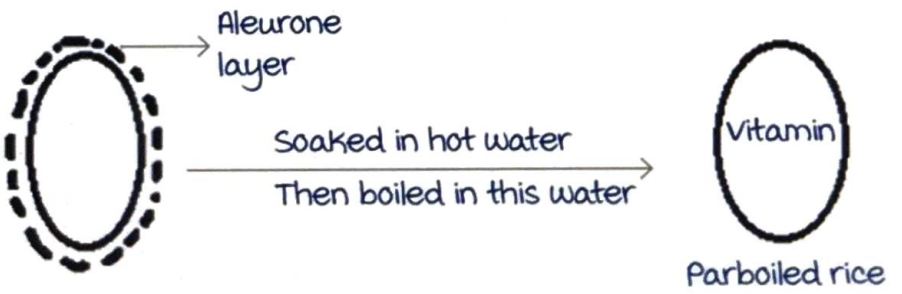
- Richest : Halibut fish.
- Other : Codfish, Yellow/Orange colored fruits.

Vitamin A prophylaxis programme :

- (6 months – 1 year) → 1 Lakh IU.
- (> 1 year – 5 years) → 2 Lakh IU 6 monthly.
- Total 9 doses : 17 lakh IU consumed by a child.
- 1 Lakh IU → 1 mL.
- Spoon → Inner circle = 1 mL ; Outer circle = 2 mL).
- Bitot's spots : most common indicator for Vitamin A deficiency ; Should be < 0.5% in school-going children.
- Night blindness in the school-going children should be < 1%.

Parboiled rice

- Rice is soaked in hot/ warm water and then boiled in the same water.
- Rich in Vitamin B_1.



Active space

Vitamin B_{12}

- Predominantly from animal sources.
- Vegetarians need to take from an exogenous source.

Vitamin C

- Used for enzymatic reaction in the body.
- Useful for humans, monkeys, and Guinea pigs.
- The richest source is Indian gooseberry (amla).

Micronutrients : Iron and Iodide

00:09:18

Iron

Sources :

1. Haeme source : Animal.
   Bioavailability → 15–30%.
2. Non-haeme source :
   Green leafy vegetables (spinach, amaranths, coriander, mint), dates.
   Bioavailability → 5–7%.
   Human milk has a bioavailability of 60–70%.

Jaggery : Richest source of iron because of the container and not from the natural source.

- 1 g of Hb = 3.47 mg iron.
- 1 mL of blood loss [illegible] (assuming the Hb concentration as 15 gm/dL)
- Total body iron : 3–5 g iron.
- (98–99)% of Indian females have iron deficiency.
- Nearly 50% of Indian women have iron deficiency anemia.

Iron absorption :

- Promotor : Vitamin C.
- Inhibitor : Phytates, oxalates, calcium, tannins.

Evaluation :

1. Hb : Epidemiological indicator.
2. Serum ferritin : m/c used indicator in anemia.
3. Serum iron
4. Transferrin saturation : Clinical indicator.

Active space

Iodine

- Sources :
  1. Soil : Onion, potatoes.
  2. Sea : Japanese seaweed.
- Goitrogens :
  Brassica group of vegetables (iodine inhibitors) :
  Cabbage, cauliflower, gourd.
- Indicators :
  1. Goiter prevalence.
  2. Urinary iodine excretion : most important epidemiological indicator.
  3. T_3/ T_4/ TSH level
  4. Neonatal hypothyroidism : very sensitive marker.
  5. Cretinism.

Fluorides, Zinc, Copper, Chromium, Selenium, Molybdenum

00:21:38

Fluorides

- Daily requirement : 0.5–0.8 mg/day.
- Double edged sword :
  a. Deficiency : Dental caries → Give supplements.
  b. Excess : Fluorosis → Defluoridate water (Nalgonda technique).

Zinc

- Immunomodulator, antioxidant.

Copper

- Deficiency : Neutropenia .
- Excess : Myocardial infarction, Hperthyroidism.

Chromium

- Carbohydrate metabolism.
- May cause insulin disturbances, diabetes mellitus.

Selenium

- Cardiac stability, myocardial infarction, coronary artery disease.
- Immunity.

Molybdenum

- Risk factor for GI cancer, esophageal cancer, oral cancer.
- Involved in bone metabolism.

60c6b3eeaa8ded0e4e7e5ea7

Antioxidants

- Vitamin A, B_a, C, E.
- Enzymes (superoxide dismutase, catalase enzyme)
- Other : Zinc, selenium, copper, flavonoids.

RDA – 2020 ICMR/NIN – MOHFW

00:26:39

Reference male and female :

- Age : 19 – 39 years.
- Weight : 65 Kg (male), and 55 Kg (female).
- Height : 95th percentile for male and female respectively.
- BMI : 18.5 – 22.9 Kg/m^2.

Energy :

	male	Female	Pregnant	Lactation	
Sedentary	2110	1660	+ 350	(0–6month) +600	(6–12month) +520
moderate	2710	2130			
Heavy	3470	2720			

Visible fat intake :

	male	Female
Sedentary	25 g/day	20 g/day
moderate	30 g/day	25 g/day
Heavy	40 g/day	30 g/day

Active space

Protein : 0.83 g/kg/day.

	male	Female	Pregnant	Lactating	
Protein	54	45.7	+9.5 (2TM) +22 (3TM)	+16.9 (0-6m) +13.2 (6-12m)	g/d
Carbohydrate	130	130	175	200	g/d
Calcium	1000	1000	1000	1200 (for postmeno-pausal women also)	mg/d
Magnesium	385	325	385	325	mg/d
Iron	19	29	40	23	mg/d
Zinc	17	13	14	14	mg/d
Iodine	150	150	250	280	mcg/d
Vitamin A	1000	840	900	950	mcg/d
Vitamin D	600	600	600	600	IU/d

Sodium : 2000 mg/day.

Potassium : 3500 mg/day.

Salt : < 5 g/day.

Dietary fibre : 40 g/ 2000Kcal.

Vitamin A conversion index : 6.

NUTRITION : FOOD PRODUCTS, ADULTERANTS AND STANDARDS

Cereals : Introduction

00:00:35

Grains : 350 Kcal / 100 g.

(6–9)g% of proteins.

60c6b3eeaa8ded0e4e7e5ea7

Maize has high amount of Leucine and fat.

Jowar has high carbohydrate content.

Bajra has high protein and fat, maximum amount of iron.

Ragi has maximum amount of calcium and low fat.

Rice : Staple food in India.

Slightly higher in lysine content.

Low in vitamin A, C, D, iron and calcium.

Parboiling : To retain vitamin B, present in outer covering of rice.

Hot soaking process.

↓

Soak the rice in 60–70°C.

↓

Let it stay for 3–4 hours.

↓

Drain the water and steam for 5–10min.

↓

Dry.

↓

Store.

Egg

00:04:00

- Oval in shape (Rule of 6).
- 60 g.
- 6g of protein ; 6 g of fat.
- 30 mg calcium.
- 240 mg cholesterol.
- 1.8 mg iron.

Weight distribution : Egg yolk, Egg shell, Egg white.

↓ ↓ ↓

30% of wt. 10–12% of wt. 58–60% of wt

Active space

Salient features of egg :

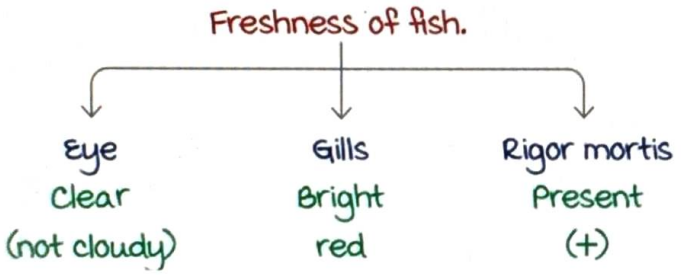
- Maximum NPU (Net Protein Utilisation) : 96.
- Richest source of cholesterol.
- Low in Vitamin C, low in iron.
- Rich in DHA (Decosa Hexaenoic Acid).
- Avidin (destroyed by heat) : Causes Biotin deficiency in raw egg consumers.

Freshness of egg :

- Fresh egg → Sinks in water.
- Rotten egg → Floats in water.

Fish :

- Rich in protein.
- Maximum protein-energy ratio (low carbohydrate).
- Fish oil is a good source of vitamin A & D.
- Fish bones are good source of calcium and phosphorus.
- Rich in iodine (deep sea fishes).



Diseases transmitted by fish :

- Fish tapeworm.
- Vibrio parahaemolyticus.
- Salmonella infections.

Milk : Sources

00:10:28

/100 ml milk	Buffalo milk	Cow milk	Human milk
Energy (Kcal)	117	67	65
Fat (g%)	6	4.1	3.1
Protein (g%)	4.1	3.1	1.1
Lactose (g%)	4.4	4.8	7.8
Calcium (mg)	210	120	28

Breast milk

Protein :

- 1/4th of buffalo milk and 1/3rd of cow milk.
- Low quantity but best quality.
- Rich in Cysteine and Taurine (conditionally essential amino acids).
  - For premature children : Cysteine.
  - For axonal growth : Taurine.
- Rich in immunoglobulins : IgA, IgG.

Fat :

- 1/2 of buffalo millk.
- Low quantity but good quality.
- Rich in PUFA (Poly Unsaturated Fatty Acid)
  - ALA (Alpha Linolenic Acid)
  - Linoleic acid
  - Arachidonic acid

  } myelination.

Carbohydrate :

- Richest source of lactose.
- Main source of energy for brain function.
- Lactobacillus bifidus (anti-infective).

Vitamins and Minerals :

- Vitamin D : Water soluble form.
- Maximum amount of Vitamin C & A (among all milk).
- Maximum bioavailability Iron (70%) : Low Ca & high vit C.
- Increased amounts of Zinc, copper, selenium (antiox dants).
- Low sodium → Nephroprotective.

Milk hygiene and pasteurization 00:20:58

Pasteurization → High level of disinfection.

Milk quality index

Lactometer :

Checks density of milk.

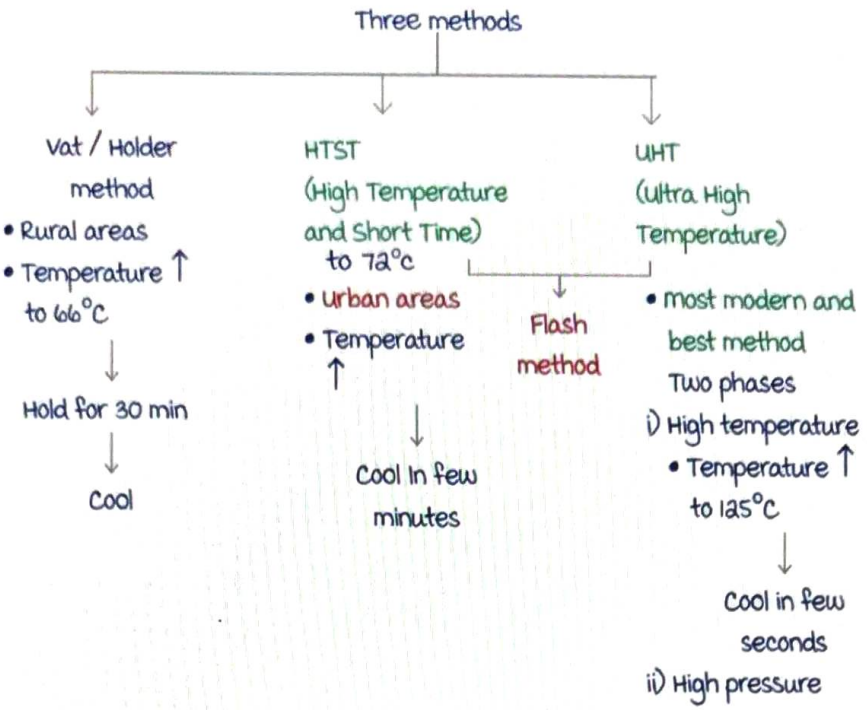
Solid non fat test (SNF test) :

Checks non-fat substances in milk.

Methylene Blue Reductase Test (MBRT Test):

To check for gross contamination.

MBRT done before pasteurization.



Check for pasteurization :

Phosphatase test :

- Enzyme destroyed by heat.
- Absent in pasteurized milk.

Standard plate/ colony count:

- < 30000 colonies/ mL in pasteurized milk.

Coliform test :

- Anaerobic bacteria which indicates fecal contamination.
- Absent/zero in pasteurized milk.

Packaged milk

60c6b3eeaa8ded0e4e7e5ea7 00:28:33

Standard milk → Buffalo milk (Fat 6 %.)

Regular milk → Cow milk (Fat 4.5 %.)

Toned milk → Fat 3 %.

Double toned milk → Fat 1.5 %.

Skimmed milk → Fat < 0.5 %.

Homogenised milk	Evaporated milk	Condensed milk
• Homogenise the fat molecules in milk.	• 50% reduction in the volume of milk.	• 75% reduction in the milk.

• Better type of milk for young children.		

Neurolathyrism

00:32:00

- Food intoxication.
- Toxin → BOAA (Beta Oxylyl Amino Alanine).
- Food product → Lathyrus sativus (Khesari dal).
- Clinical features → Neurological ; Joints (Knee > Hip).

Five stages

1. Latent stage :
   Asymptomatic.
   Important stage for prevention (Diet without dal).
2. No stick stage :
   Jerky steps.
   Limping gait.
3. One stick stage :
   Clumsy gait.
   One stick used to walk.
4. Two stick stage :
   Two sticks used to walk.
5. Crawler :
   Inability to walk/stand.
   Atrophy of thigh.
   Bent knee.

Prevention methods :

- Steeping.
- Parboiling with lime.
- Vitamin C prophylaxis.
- Avoid dal in diet.

Food adulteration diseases

00:36:14

1. Endemic ascites :

60c6b3eeaa8ded0e4e7e5ea7

- Toxin : Pyrrolizidine.
- Food product : Millets adulterated with Crotalaria seeds.
- C/F : Hepatotoxic.

Active space

- Prevention : Sieving, filtration.

2. Endemic dropsy :
   - Toxin : Sanguinarine (Argemone mexicana).
   - Food product : Mustard oil.
   - C/F : Glaucoma, congestive cardiac failure, pleural effusion, pedal edema and diarrhea.
   - Prevention :
     1) De-weed (before mixing with oil).
     2) Nitric acid chromatography test :
        Check sanguinarine adulteration in mustard oil.

Food-related fungal diseases 00:40:47

1) Aflatoxicosis : (Storage fungus).
   - Toxin : Aflatoxin secreted by Aspergillus flavus.
   - Food product : Any stored food in godown (grains, nuts, rice).
   - Most common food affected : Ground nut.
   - C/F : Hepatotoxic, cirrhosis.
   - Prevention :
     Increase ventilation & decrease moisture in storage place.

2) Ergotism : (Plant / Field fungus)
   - Toxin : Ergot alkaloid.
   - Food product : Jowar, rye, sorghum.
   - C/F : Gastrointestinal toxicity.
   - Prevention : Float the plant in 20% salt solution.

Food quality and standards 00:44:18

FSSAI :
Food Safety and Standards Authority of India.
Autonomous body under ministry of health & family welfare.
Started in 2006 (Prevention of Food Adulteration act).
Any products consumed for nutrition should be FSSAI accredited.

- Agmark :
  Not mandatory, not a law.
  Agriculture mark.
  For raw food, seeds, plants.

- Codex alimentarius :
  International standards for quality of food products.

Nutritional surveillance and assessment 00:47:40

Nutritional assessment in children

- Weight for age : most sensitive.
- Weight for height : Acute malnutrition.
- Height for age : Sensitive for chronic malnutrition.
- Shakir tape : Mid arm circumference.

Biochemical tests used in nutritional surveys :

Nutrient	Normal value	Remarks
Vitamin A	20 mcg/dl	
Vitamin B7	6 mcg/ml	Serum Folate
Vitamin B12	160 mg/L	Serum B12
Vitamin K	11-16 secs	PT
Proteins	35 g/L	Serum Albumin
	20 g/L	Serum transferrin
	250 mg/L	Thyroid binding pre-albumin

- Serum albumin : most sensitive for protein estimation.

Functional indicators :

Structural Integrity	Erythrocyte fragility Capillary fragility Tensile strength	Vit E, Selenium Vit C Copper
Host defence system	Leucocyte chemotaxis Leucocyte phagocytic and bactericidal capacity Delayed cutaneous hypersensitivity	Protein energy, zinc Protein energy, iron Protein energy, zinc
Homeostasis	Prothrombin time	Vit K
Reproduction	Sperm counts	Zinc, Vit E, Energy
Nerve function	Nerve conductions Dark adaptations EEG	Vit B1, B12 Vit A, Zn Protein energy
Work capacity	Heart rate Vasopressor response	Iron, Protein energy Vit C

Active space

AIR AND METEOROLOGY

World clean air day observed on 7th September every year.
Theme for the year 2021 : Clean air for blue skies.

Air requirement parameters

00:01:50

Air requirement for an average person : 3000 cubic feet/hr.
: 2 – 3 times air changes per hour.

< 2 air changes per hour : Inhalation of Stale air.

> 6 air changes per hour : Lead to dryness/ drought like condition.

Air pollution :

- Primary air pollutants :

60c6b3eeaa8ded0e4e7e5ea7

Simple gases like CO, CO_2, SO_2, NO_2, NH_3, CFC, Ozone gases.

Measurement of CO_2 levels : By Kiffer test.

Sulphur dioxide :

Most important primary air pollutant for industrial pollution/ development of a country.

Carbon dioxide :

Most responsible gas for greenhouse effect or global warming.

Primarily responsible for climatic change.

Skin cancers are associated with depletion of ozone gases (Ozone layer absorbs UV B rays).

- Secondary air pollutants :

Dust (particulate matter)	Smoke
measured using Grit index.	measured by Soiling index.
Both parameters combined to form 'coefficient of haze'	

Disinfection of air :

- Mechanical methods : Improve ventilation.
- Chemical methods : Fumigation done using TEG (tri ethyl glycols), formaldehyde.
- Radiation : UV rays, gamma rays.
- Dust control.

Thermal comfort parameters

00:09:25

1. Temperature : measured by air thermometer.
2. Humidity : measured by psychrometer/hygrometer.

sling psychrometer

60c6b3eeaa8ded0e4e7e5ea7

3. Air movement/circulation : measured by anemometer

4. Cooling power of air :
   measured using Kata thermometer.
   Has 2 thermometers : Dry Kata & wet Kata.
   Kata also used to measure low air velocities.

Red bulb and piece of cloth : Kata thermometer.

5. Radiant heat :
   Transferred heat/convection heat.
   measured using globe thermometer.

Active space

Different types of temperature 00:20:01

- Simple air temperature.
- Effective air temperature (ET) :
  Combination of temperature + humidity + air movement + cooling power of air.
  It does not include radiant heat.
- Corrected effective air temperature (CET) :
  Effective air temperature (ET) + radiant heat.
  One of the best indicators to measure thermal comfort.

Air comfort indices : McArdle's index.
Also called as Predictable 4 hour sweat rate (P4SR).
If P4SR < 1 : very comfortable zone.
1 – 3 : Just comfortable.
3 – 5 : Just tolerable.
> 4.5 : Not tolerable.

Heat stress index (HSI) :
It is the capacity of evaporation.

$$\text{Heat stress index} = \frac{\text{Evaporation required for the maintenance of heat balance}}{\text{Total maximum evaporation permissible for that individual.}}$$

Values range from 0 – 100.
Permissible HSI :
0 : Minimum
0 – 10 : Comfortable.
10 – 30 : Mild/moderate HSI.
30 – 70 : Severe HSI.
> 70 : Very severe HSI (not tolerable).

Active space

Relative humidity

00:27:39

$$\text{Relative humidity} = \frac{\text{Amount of water vapour in air}}{\text{maximum water vapour carrying capacity}} \times 100$$

Expressed as percentage (%).

Normal values range from 35 – 65 %.

< 35 % : Very dry.

> 65 % : Very hot and humid.

Air pollution monitoring :

Biological indicator : Lichens.

Industrial air pollution : Sulphur dioxide.

Secondary air pollution : Dust/particulate matter.

60c6b3eeaa8ded0e4e7e5ea7

Air quality index (AQI) :

Made by Centre for Pollution Control Board (CPCB) in India.

CPCB is under the ministry of forest, environment and climatic change.

8 variables in AQI :

1. PM 10
2. PM 2.5
3. NO_a
4. O_3
5. CO
6. SO_a
7. NH_3
8. Pb

Does not include CO_a.

PM 10 means particulate matter ≤ 10 micron.

PM 2.5 : Ultra fine particles.

Only heavy metal checked by AQI in India : Lead (Pb).

Active space

AQI values and their health impact :

Remark	AQI	Possible health impact
Good	0 - 50	Minimal impact.
Satisfactory	51 - 100	Minor breathing discomfort to sensitive people.
Moderate	101 - 200	Minor breathing discomfort to the people with asthma, resp. and heart diseases.
Poor	201 - 300	Breathing discomfort to most people on prolonged exposure.
Very poor	301 - 400	Respiratory illness on prolonged exposure.
Severe	401 - 500	Affects healthy people and seriously impacts those with existing diseases.

International level agreements 00:33:11

Kyoto protocol :

- Signed on 11. 12. 1997, Japan.
- To decrease greenhouse gases.
- To promote the use of renewable sources of energy.

Paris agreement :

- Signed on 04. 11. 2016 , France.
- To decrease carbon dioxide emission.
- To increase the use of renewable sources.
- To improve AQI.

Active space

WATER : PART - 1

Water and diseases :

20% of all diseases are water associated : Dehydration, water borne, water based/ related.

3.5 lakh under five deaths in India : Water associated diseases.

60c6b3eeaa8ded0e4e7e5ea7

National loss of 150 million USD : Time wasted in travelling to fetch water and to return home.

Norms of water supply

00:02:14

In rural areas : 30 to 40 LPCD.

In urban areas : 150 to 200 LPCD → sewage system requires more water.

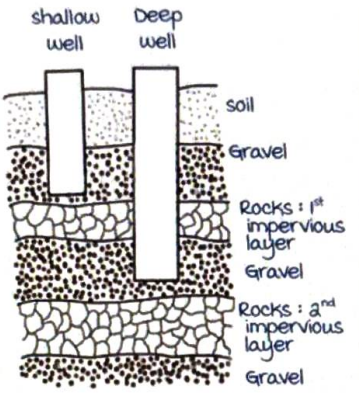
- LPCD : Liters per capita in day.
  For drinking : 1 to 5L of water per day.

Sources of water :

- Rain water.
- Surface water :
  Rivers, streams, canals, sea and ocean.
  Impounding reservoirs : Natural or manmade.
  Catchment area of dam → man made impounding reservoir.
- Ground water :
  Wells, tube wells.

Wells :

Classified based on material type, depth and engineering/ design.

material type	Depth	Engineering/ design
Kutcha well : Uses soil. Pucca well : Has brick lining.	Shallow well. Deep well. 	Simple well : Digging into the earth. Tube well. Artesian well : Between two high pressure zone.

Sanitary well :

- Covered on the top.
- Pucca well : Brick lined.
- Boundary wall should be 3 feet or more.
- Cemented ground around the well. Radius should be 3 feet around the well.
  Prevents contamination from surrounding run off.
- Water quality should be checked.
  Proper chlorination should be done.
  Water should be safe to drink.
  No heavy metal contamination, hardness value should be less.

60c6b3eeaa8ded0e4e7e5ea7

Non sanitary well :

- No cemented wall.
- Kutcha well.

Pucca well

Active space

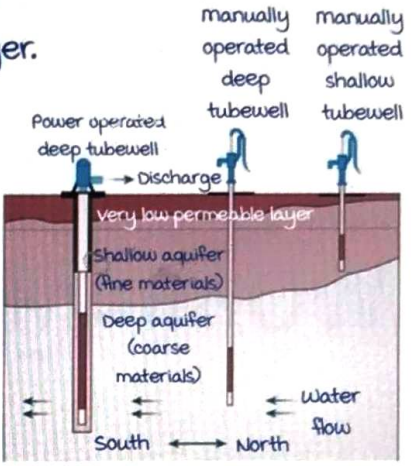
Step well :

Not advocated anymore as people carrying diseases could transmit it.

Step well

Tube wells :

- Manually operated shallow tube well. Water drawn by hand pump. Above the first impervious layer. Can dry.
- Manually operated deep tube well. Difficult to draw water as it is manually operated. Does not dry.
- Power operated deep tube well.

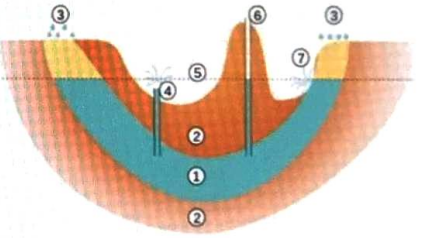


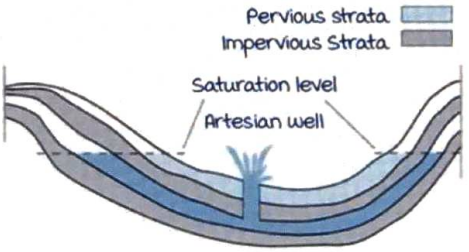
Artesian well :

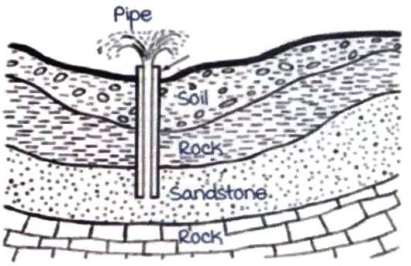
Will never dry, even if it is shallow.

In the figure given :

- 3 is the recharge area. The water gets trapped between the 1st and 2nd impervious layer, as it cannot pass beneath the 2nd impervious layer.
- If a hole is dug, even in the superfluous layer would have water all the time, because of constant recharge from the sides.







Active space

Water quality parameters 00:16:07

Assessed by :

1. Physical quality parameters.
2. Chemical quality parameters.
3. Biological quality parameters.

Physical parameters :

- Color.
  Permissible colour <15 TCU (true colour units).
  Ideally should be <5 TCU.
- Odour.
  Should be odourless.
- Turbidity.
- Temperature.

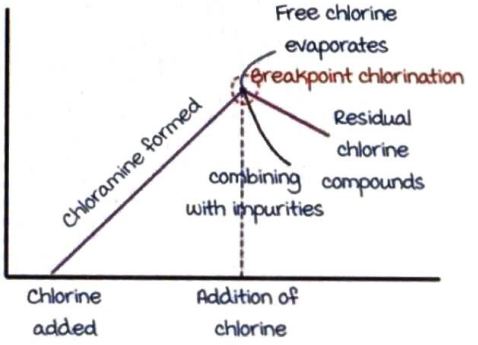
Chemical parameters :

- Chlorination.
- Hardness of water.
- Other chemical parameters.

Chlorination 00:18:49

Disinfection of water.
Mechanism of action → Formation of free radicles.

- Hypochlorous ion : Main action.
- Hypochlorite ion.



Principle of chlorination :
Disinfection happens when chlorine is added to form breakpoint chlorination.
On adding chlorine to contaminated water, initially it reacts with the ammonium compounds from organic materials → Forms Chloramine.
After all ammonium compounds are exhausted, addition of

Active space

more chlorine forms :

- Residual chlorinated compounds :
  Free residual Chlorine compounds (FRC).
  Combined Chlorine compounds (CC) : Bound with harmless compounds.
- Chlorine liberated as free chlorine : Evaporates.
- Mix with impurities to form chloride salts.

Free residual chlorine combines with water to form hypochlorous and hypochlorite ions.

Break point chlorination : The point where the chlorine start destroying chloramines.

Horrock's apparatus

00:26:39

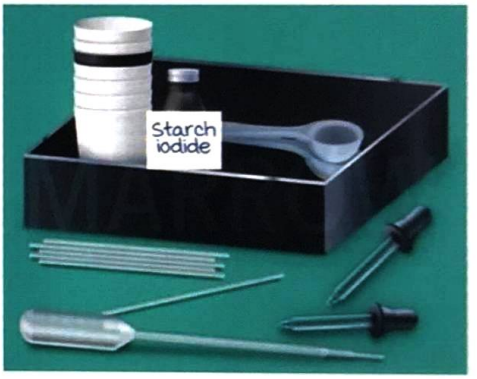
60c6b3eeaa8ded0e4e7e5ea7

measures the chlorine demand in the water.

Chlorine demand = (Amount of chlorine added to water) − (Amount of residual chlorine in water after 60 min).

Components :

- One black cups.
- Six white cups.
- Reagent : Starch iodide.
- Stirrers.
- Spoon.



Stock solution is made in the black cup.

- Stock solution : 2gm bleaching powder made to paste with minimal water. Water added till the mark.
- Water to be tested, from one source, is poured in all six white cups.
  Stock solution is placed in each white cup.
- 1st cup → 1 drop.
- 2nd cup → 2 drops.
- 3rd cup → 3 drops.
- 4th cup → 4 drops.
- 5th cup → 5 drops.
- 6th cup → 6 drops.

Wait for half an hour.

Active space

3 drops of starch iodide (turns blue with free residual chlorine) added to all white cups.

For e.g. : If the 3rd cup turns blue.

Bleaching powder required to disinfect 455L of water

= 2 gm x number of cup that turned blue first.

= 2 gm x 3.

= 6 gm.

6 white cups with increasing drops of stock solution

Black cup with stock solution

3rd cup turns blue with starch iodide first

Adding chlorine :

Bleaching powder	Perchloron	Chlorine gas
House hold bleach : sodium hypochlorite.	Commercially available solution of Calcium hypochlorite. Also called High test hypochlorite solution.	Amber/ yellow coloured cylinders.
Gives 33% free chlorine.	Gives 66% free chlorine.	Gives 100% free chlorine.

Chlorine level estimation 00:36:11

Chlorine level in water checked by Chlorimeter/Chloroscope.

In chloroscope, reagent used can be orthotoluidine.

- Orthotolidine measures free residual chlorine, combined residual chlorine and chlorine salts with impurities.
- Less reliable as does not give free residual chlorine exclusively.

Chloroscope

Orthotoluidine arsenate (OTA) test :

Sodium arsenate present, which dechlorinates the water.

Better test than Orthotoluidine (OT) test.

Gives free residual chlorine & combined chlorine as separate values.

Active space

Initial colour change → Free residual chlorine.
Permanent colour change → Other combined chlorines and impurities.

Level of chlorine :
Permissive level in potable/drinking water :
> 0.5 ppm (0.5 mg/L) after a contact time of 1 hour.

Hardness of water

00:41:56

Temporary hardness	Permanent hardness
Ca, Mg carbonates or bicarbonates.	Ca, Mg sulphates or phosphates.

1 mEq of hardness = 50 mg of calcium carbonate.

Water hardness :

- < 1 mEq → Soft water.
- 1 to 3 mEq → Moderately hard water : Drinking water.
- 3 to 6 mEq → Hard water.
- > 6 mEq → Very hard water.

Treatment of hard water :

- Boiling.
  Energy consuming → Expensive.
  Decreases the quantity of water.
- Lime.
- Soda ash.

  — Small communities/ rural areas.

60c6b3eeaa8ded0e4e7e5ea7

- Permutit (sodium zeolite) : Ca & Mg chelator used in large scale/commercial level.
  $(Na_2Al_2Si_2)$

Other chemical parameters

00:46:00

Chlorine levels > 0.5 ppm after a contact time of 1 hour.
Chloride level < 250 mg/L.

Total dissolved solids (TDS) :
Inorganic chemicals : Should be < 500 to 600 mg/L.

Active space

Nitrates and nitrites :

Both signify organic matter/ fecal contamination.

Nitrites <3 mg/L.

Nitrates <50mg/L.

Nitrate- nitrite ratio :

$$\frac{\text{concentration of nitrate}}{\text{Guideline value of nitrate}} + \frac{\text{concentration of nitrite}}{\text{Guideline value of nitrite}}$$

< 1 is permissible level.

Fluoride levels :

Fluoride is a double edged sword.

In drinking water : < 1 ppm.

Ideally, in water : 0.5 to 0.8 mg/L. 60c6b3eeaa8ded0e4e7e5ea7

If < 0.5 mg/L → Fluoride deficiency causing dental caries.

- Fluoride supplementation of water or food products.

If > 0.8 mg/L → Fluorosis due to fluoride excess.

- Nalgonda technique for defluoridation of water.

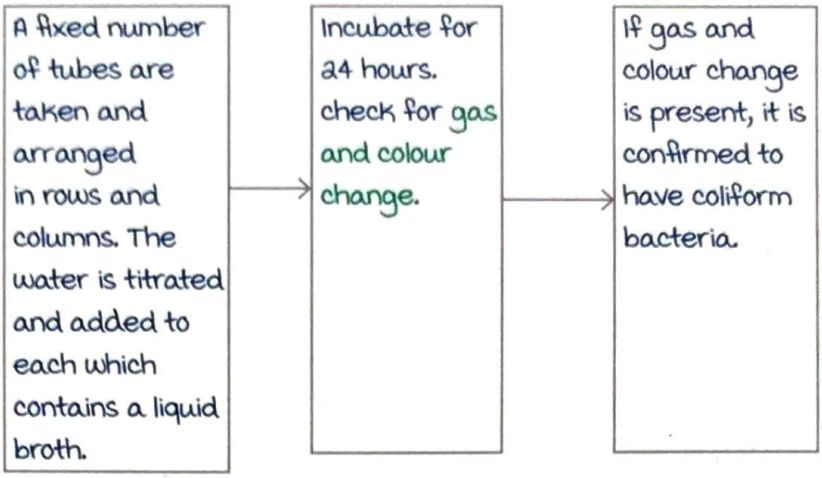
Parameter	Range
Optimum – pH	7.5 (range of pH = 6.5 to 8.5)
Total dissolved solids (affecting turbidity	< 500 to 600 mg/L (maximum permissible till 1000 mg/L)
Total hardness	3 mEq/L (1 to 3 mEq/L of $CaCO_3$)
Iron	0.3 mg/L
Calcium	75 mg/L
Sulphate	200 mg/L
Chlorides	250 mg/L (taste alter > 250mg/L, maximum permissible 600 mg/L)
Nitrates, Nitrites	< 50 mg/L, < 3 mg/L

Biological parameters 00:53:26

Coliform test :

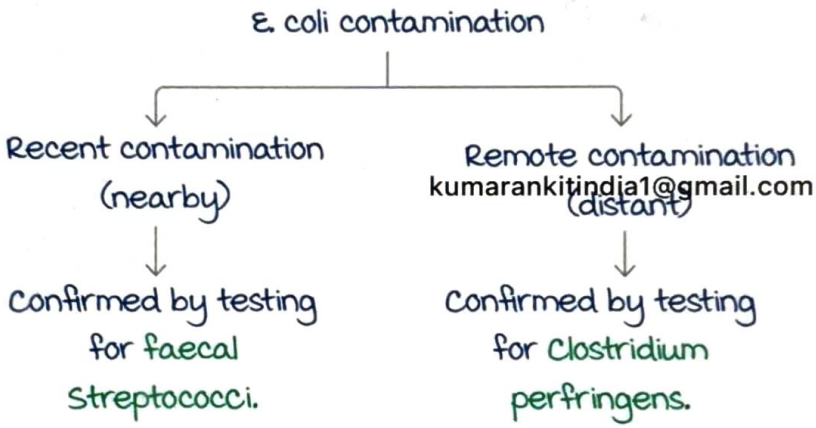
E. coli is most sensitive to assess biological contamination of water.

Done by McCartney chart method : most probable number method.



Falsely positive : Presence of Klebsiella.

- To rule out Klebsiella : Eijkman test.



Radiological aspect of water quality

00:58:45

Alpha activity : < 0.5 Becquerel/L.
Beta activity : < 1 Becquerel/L.

WATER : PART - 2

Water purification

00:00:32

Purification on large scale :

- Storage.
- Filtration.
- Disinfection.

Purification on small scale :

- Disinfection of wells.
- Household water purification.

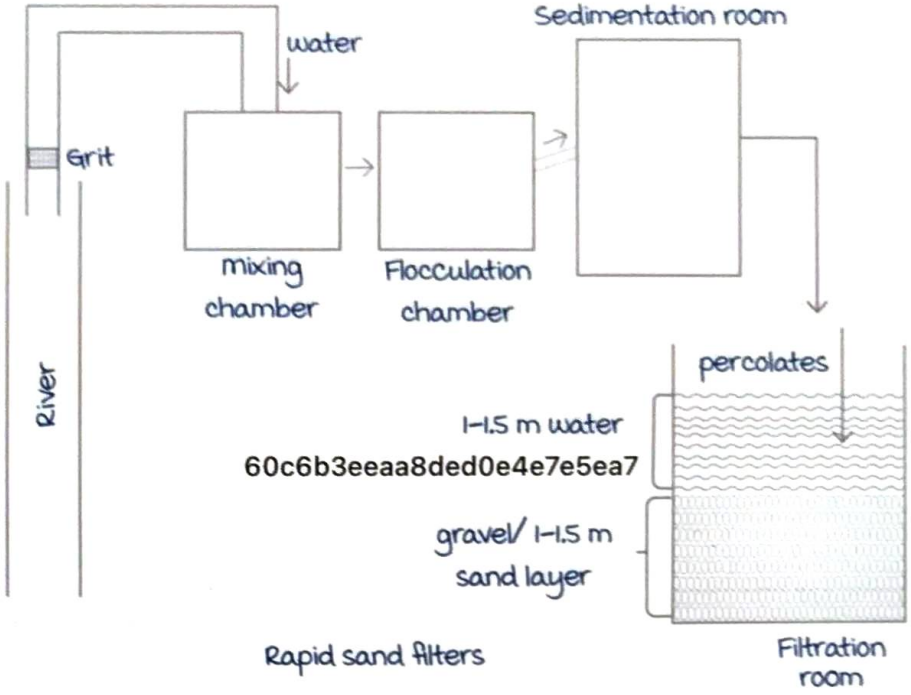
Storage :

- 90% of impurities will settle if water is stored.
- Storage of 5–7 days will result in gross bacterial load reduction of about 70%.
- Ideal time : 10–15 days.
- Under the action of oxidizing bacteria, there will be reduction in ammonia and nitrate/nitrites.

Rapid sand filters

00:02:36

1. Mixing chamber : Alum (5–50 mg/L) is mixed with water from sources such as rivers. (Alum can be mixed up to 100 mg/L).
2. Flocculation chamber : Churning of water occurs and froth forms. Impurities will mix with alum and float on top as froth.
3. Sedimentation tank : Water collected from other chambers are stored here for 2–6 hours.
4. Filtration room : Water percolates through gravel of size 0.4–0.7 mm and sand layer of 1–1.5 m thick and gets purified.
   This is the main functioning part in rapid sand filters.
   The water is then chlorinated and distributed.



Large impurities are stopped at the grit level (iron mesh).

Choking/loss of head of water, in sand filter refers to increasing water level in the filtration room due to dirt building up on the sand layer and water does not percolate. This can be identified by rise in water level in filtration room and decrease in water level in the siphon.

Normal level of water in a rapid sand filter: 1–1.5 m.
Loss of head permissible : 6–8 ft.
Minimum level of water in a rapid sand filter : 1– 1.5 m.

Slow sand filter

00:14:08

- Consists of a bigger room with sand and gravel through which water is filtered.
- No sedimentation tank or preliminary storage available.
- Almost obsolete now.
- Backwash method cannot be used for clearing up the dirt layer in slow sand filter because of the zoogleal/ vital/biological/schmutzdecke layer present in the gravel.
- The algae/flora layer oxidizes and filters the water.

	Rapid sand filter	Slow sand filter
Capacity	200 mgad	2–3 mgad
Rate of filtration	5 – 15 $m^3/hr/m^2$	0.1–0.5 $m^3/hr/m^2$
Loss of head	6–8 ft	4 ft
Sand gravel	0.4–0.7 mm	0.2–0.3 mm
Preliminary treatment	Yes, sedimentation tank	No
Washing/cleaning	Backwashing done	manual scrapping
Purity	99%	99.99%
Space Required	less	more

mgad : million gallons a day.

- Backwash can disrupt this layer.
- Instead, scraping of the dirt is done manually.

Disinfection 00:22:29

- Chlorination : Chlorine gas is used. Cl gas at a level of > 0.5 ppm is used after a contact time of 1 hour.
  In case of impending outbreaks or risky areas,
  > 0.7 ppm is used.
- Ozonization :
  Dry O_3 gas passed under high voltage gates, causing decrease in microbial load and destroys hazardous chemicals like pesticides/organic chemical.

  For good ozonization, gas used should be > 0.5 mg/L with a contact time of 20 mins.
  Ideally, >2.5 mg/L.

  Ozone filter does not have any residual effect, therefore it needs to be coupled with other filtration methods.

- membrane process :
  Semipermeable membrane is used to filter by passing water through pores.

Low pressure :

Pore sizes :

Microfiltration : < 0.2 μm.

Ultrafiltration : < 0.1 μm.

Less efficiency but high water output.

High pressure :

Pore sizes :

Nanofiltration : <0.01 μm.

Reverse Osmosis : <0.002–0.001 μm.

Smallest pore size with highest efficiency, best water quality but low water output.

Purification on a small scale 00:30:27

Usually at villages/rural areas/slums/community level.

Disinfection of well :

- Height of well should be at least 3 ft.
- Cemented ground of radius of at least 3 ft.
- > 50 m away from any contamination.

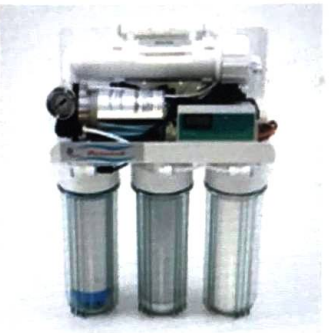
- Bleaching powder is used to disinfect wells.
- Volume of well : $\pi r^2 h \times 1/4$ (r= radius, h = depth of well).
- Normally, 2.5 gms of bleaching powder is enough for 1000L (i.e., 0.5–0.7 ppm of free Cl).
- In case of outbreaks : Double pot method is used.
  1 Kg bleaching powder in a double pot method is enough for 2–3 weeks for a well of 4500 L with a water consumption of 350–450 L/day.

Household purification of water :

- Roll boiling for 10 –20 min (least preferred).
- Chemical disinfection :
  1. Bleaching powder (33% of free Cl).
  2. Chlorine solution : 4Kg of bleaching powder in 20 l water (1 bucket of water), gives a 5% chlorine solution.
  3. High test hypochlorite solution (66% free Cl).

4. Chlorine tablets :
   Halazone tablets : USP (United States Pharmacopoeia) 4 g, 100 g mass & provides 2-4 mg/L of Cl in 1 L of water.
   NEERI (National Environmental Engineering Research Institute), Nagpur, manufactured tablets, 0.5 g sufficient for 20 L water.
5. Iodine solution.
6. Potassium permanganate (alters smell/taste/harmful to eyes).

- Household filters.
  1. Katadyn filters
  2. Pasteur chamberland filters } obsolete
  3. Berkefeld filters
- UV radiations :
  254 nm wavelength. Less residual effect.
- Multistage RO filters :
  most commonly used.



Different chambers in RO filter are :

1. Sediment Filter : Works to decrease the particle/solute/large impurities.
2. Carbon Filter : Chemical disinfection.
3. Gag filter : To change the color, taste and odor of water.
4. RO membrane : <0.002-0.001 pore size membrane.

Swimming Pool Sanitation :

- Chlorine levels should be > 1 ppm.
- > 15% of water should be changed every 24 hrs.
- pH should be maintained at 7.4-7.8
- Area should be more than 24sq.ft/swimmer.

Water and disease

00:46:27

- Water borne diseases :
  Diarrhea, gastroenteritis, typhoid, cholera.

- Water washed diseases :
  Scabies, trachoma, dermatitis (these diseases are washed away with water).
- Water based diseases :
  Vector enters the agent's environment.
  Swimming pool conjunctivitis, dracunculosis (guinea worm disease).
- Water related diseases :
  Agent or vector not directly related to water environment, but disease spreads due to water.
  Malaria, dengue, chikungunya.

National Water and sanitation program :

- Started in 1954.
- To provide a clean, safe & ample source of water at all levels (urban & rural).
- Objectives :
  1. Water supply within 100 m of houses.
  2. Not more than 30 mins of walk to the water source.
  3. more than 1 water source required for houses more than 250.

Problem village :

Village without a water supply within 1.6 Km or depth of ground water > 15m or water from ground has excess salinity/minerals/radioactive/heavy metals.

Swajaldhara 00:52:36

Initiative to ensure water supply in all areas.

- Swajaldhara I : At gram panchayat level.
- Swajaldhara II : At district level.

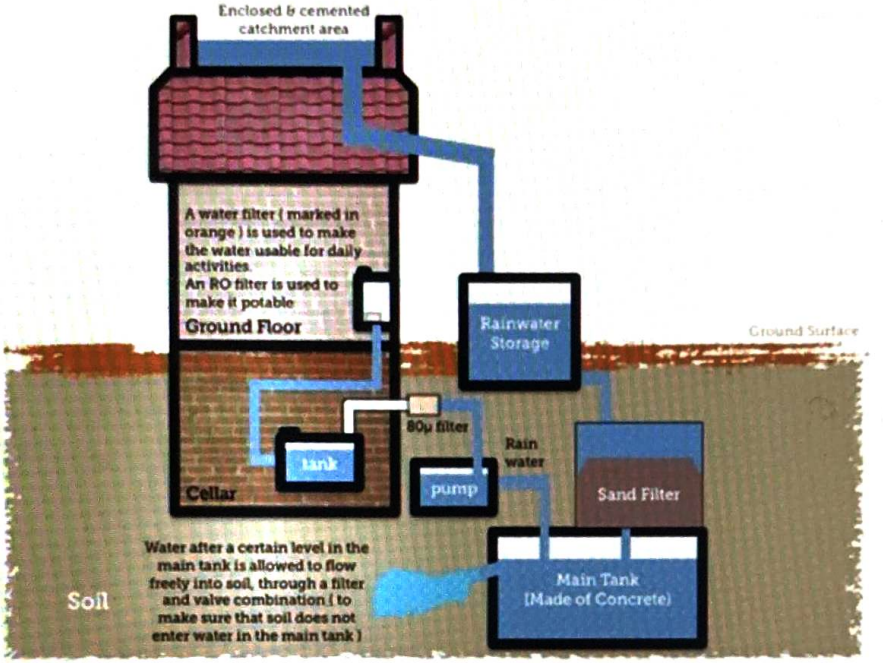
Rain water harvesting :

- Purest method.
- Cost effective.

Active space

Can be done at :

1. Household level.
2. Community level : Special buildings to harvest rain;
   Warka : In deserts, a cloth of specific pore size is placed over 2 iron rods. The moisture is extracted as the wind hits the cloth (extraction of water from air).
3. Legislative level.



60c6b3eeaa8ded0e4e7e5ea7

Active space

HOUSING, VENTILATION, LIGHT, SOUND AND RADIATION

Ventilation 00:00:24

2 to 3 air changes per hour is required for good and healthy ventilation.

Types :

- Exhaust : Air from inside is thrown outside.
- Plenum : Air from outside is thrown inside.
- Mixed/crossed/wind effect : combination of plenum and exhaust ventilation (ideal ventilation).

Overcrowding 00:01:30

Criteria :

- Gender criteria : 2 persons of opposite gender (except husband & wife), age >9 years, sharing a single room.

- Space criteria : Floor space.

Floor area	Maximum persons recommended
< 70 sqft	1 person
< 110 sqft	2 persons
< 150 sqft	3 persons
< 190 sqft	4 persons

Floor area for more than 2 persons : 110sqft + 40 sqft/person.

Housing 00:03:06

Housing standards in India :

- Site : > 15 m away from road (in urban).
  > 25 m from cattle (in rural).
- Wall : 9 inches thick (outer wall).
- Roof : Pucca (cemented / iron).
  House is pucca if the roof is pucca.
  > 10 feet high (for ventilation).

< 8 feet is not allowed as per public health norms.

- Rooms : ≥ 2 rooms.
- Every room should have door and window.
- Door : 1/5th of the floor area.
- Windows : 1/5 floor area.
  (Door + window : 2/5 of floor area).
- Windows are placed at height of > 3 feet from the ground.
- Lighting : Day light factor > 1% over half of floor area.
- Water source : Not more than 100 m or 30 min walk away.

Lighting 00:06:50

measurement of light :

Parameter	Name	Unit	Other unit
Brightness of point source	Luminous intensity	Candela	Candle power
Flow of light	Luminous flux	Lumen	
Amount of light reaching surface	Illumination/ Illuminance	Lux	Foot Candle or Lumen/ cm^2
Amount of light re-emitted by surface	Brightness/ luminance	Lambert	Foot Lambert or Candle/ cm^2

Reflection factor : Surfaces that can contribute to room lighting.
Ceiling : 70–80 %.
Wall : 40–60 %.
Furniture : 20–30 %.
Floor : 10–20 %.

Artificial lighting 00:12:32

- Direct light : Directly from source to surface.
- Indirect light : Something in path of light from the source, diffuse or filters the intensity and evenly spread to the surface.

Types :

1. Direct artificial lighting : 90% direct, 10% indirect.
2. Semi direct artificial lighting : 60–70% direct , 30–40% indirect.
3. Indirect artificial lighting : >90% indirect ; <10% direct.
4. Semi indirect lighting : 60–70% indirect ; 30–40% direct.
5. Directly indirect lighting : 50% direct, 50 % indirect.
   Best lighting equilibrium.

Light sources :

Light sources	Light energy	Heat energy (energy wasted)
1. Tungsten filament bulb (conventional)	5–10%	90–95 %
2. CFLs (Compact Fluorescent Lamp)	20–25%	75–80%
3. LEDs (Light Emitting Diodes)	70–75%	25–30%

Ujala scheme : By the Government of India.
To promote the usage of LED.
National saving of electricity.

Good lighting/day light factor (dF) :

$$\frac{\text{Amount of illuminiscence inside}}{\text{Amount of illuminiscence outside}} \times 100$$

Dark room : <2 dF.
Bedroom/dining hall : >8 dF.
Kitchen : >10 dF.
Permissible limits of lighting : >100 lux (appropriate for living).
Office work/studies may require >400 lux.
Precision work may require 1000–2000 lux.

Sound

00:19:49

Units of sound measurement :

Intensity (dB or decibel)

60c6b3eeaa8ded0e4e7e5ea7

Frequency (Hz or Hertz)

Phon : Psychoacoustic unit of measurement.

Intensity of sound + frequency of sound.

Permissible sound limits for normal hearing : <85 dB.

Audible range of sound frequency : 20–20,000 Hz.

Whispering range : 20–40 dB.

Soft whisper : 20–30 dB.

Area	Permissible sound limits
Residential area	<45 dB
Commercial area	<70 dB
Factories /industrial area	<75 dB
Hospital wards during night hours	<45 dB

Sound and hearing impairment :

Intensity of sound	Hearing impairment
>85 dB	Auditory fatigue
>110 dB	may cause temporary hearing loss
>120 dB	may cause permanent hearing loss
>160 dB	may cause rupture of tympanic membrane.

Hearing loss grades :

25–40 dB	Mild
40–60 dB	Moderate
60–80 dB	Severe
> 80 dB	Profound

Radiation

00:26:05

measurement of radiation :

- Radiation exposure (Roentgen or Coulomb/Kg) : Amount of radioactive element present per ml of air.
- Absorbed dose (Gray/rad) : Radiation energy required to raise 1 Joule of energy from mass of 1 Kg.
- Different source has different absorption dose.
- Dose equivalent (Sievert/rem) : Absorbed dose multiplied with modifying factor (quality factor of radiation : Constant).

Examples for quality (Q) factor:

1. X-ray/β-rays/γ-rays : 1.
2. Neutron rays : 10.
3. α rays : 20.

Unit of	Units
Radiation exposure	Roentgen or Coulomb/Kg*
Absorbed dose	1 Gray* = 100 rads
Dose equivalent	1 Sievert* = 100 rems

*newer units

Sources of radiation :

Natural sources (0.5-1000 mrads/year)	Man made sources (0.5-5 rads/year)
Cosmic radiation : 30 mrads/year Atmospheric radiation : 2-5 mrads/year Terrestrial radiation : 50- 1000 mrads/year Internal radiation : < 0.5 mrads/yr	Fluoroscopy : 3.5-4 rads/year.

Types of radiation (based on wavelength) :

1. Ionising radiations :

α rays > β rays > γ rays > X rays.

X rays : Lowest wavelength.
Least harmful.

α rays : Maximum wavelength.
Most dangerous.

Active space

2. Non ionising radiations :

Radiofrequency waves > Microwaves > Infrared rays > UV rays (lowest wavelength)

more wavelength → more penetrating capacity → more harmful.

Biological effects of radiation exposure :

Upper limit/ permissible level of radiation exposure for humans is < 5 rads/year.

Radiation exposure	Biological effects
Up to 5 rads/year	Permissible level
50–100 rads/year	GI effect, blood cell changes.
150–1000 rads/ year	Intense symptoms, haemorrhage, capillary leaks, organ damage. Death by 2–3 weeks.
≥ 1000 rads/year	Multiple Organ Dysfunction (MOD), genetic level changes , death. Death by 6–7 days.

Active space

WASTE AND SEWAGE DISPOSAL

Waste management 00:00:09

- Municipal corporation waste.

Types

Solid waste.

- Garbage :
  Kitchen waste.
  Organic waste.
- Rubbish :
  Household waste.
  Non organic waste.
- Ash.

60c6b3eeaa8ded0e4e7e5ea7

Liquid waste.

- Sullage :
  Liquid waste without fecal matter.
  Also known as grey water.
- Sewage :
  Liquid waste with fecal matter.
  Also known as black water.

Solid waste disposal methods 00:02:40

- Dumping :
  Most insanitary approach.
- Control tipping :
  Most suitable, if land is available.
  Can be of 3 types :
  1. Trench method :
     Depth : 2–3 m.
     Length : 4–12 m.
     Population : 10,000.
     Area : 1 acre.
  2. Ramp method : Only possible in hilly terrains.
     Fill up some area with waste and fill earth above it.
  3. Area method :
     Natural depressions are used, filled with refuse.
     12 inch of soil is added to the refuse every time.

- Incineration :

  Burning at very high temperatures (> 1000°c).

  Disposing every municipal waste by this method is not practically possible.

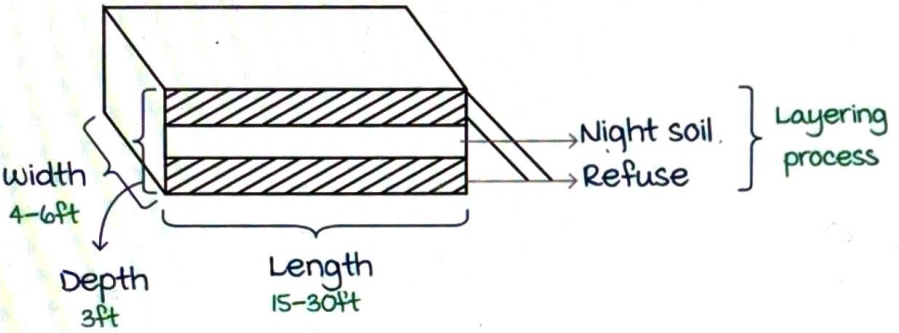
- Composting : Currently used.

  Combined refuse + Sludge / night soil (fecal matter).

  Humus

  Can be done using Bangalore method :

  A trench is made : 3 ft x 4 - 6 ft x 15 - 30 ft.



  Layering process :

  Anaerobic digestion of night soil.

  Formation of humus takes 4-6 months.

  Ratio of night soil to refuse = 1:3 (2 inches : 6 inches).

  Heat production over days : > 60°c.

- Manure pits :

  In rural areas.

  2 pits are used.

- Burial method :

  Pit size = Length x width (1.5m) x depth (2m).

  If the length is taken as 1m, this method can be effective for 200 people for 7 days.

- Mechanical composting :

  Refuse undergoes pulverisation (shredding).

  It is then mixed with previous compost or night soil or excreta. This made into compost.

  Done under strict pH, moisture, temperature levels.

Liquid waste types

00:14:29

- 2 Types:
  1. Sewage : Fecal waste.
     Amount of fecal matter excreted by an average Indian per day : 100-140g /day.
  2. Sullage.

- Strength of sewage :
  1. Biological O_a Demand :
     Amount of O_a required by excreta (usually in 5 days) at temperature of 20°c for Aerobic digestion.
     BOD Values :
     < 100 mg/L : Weak sewage.
     100-300 mg/L : Moderate sewage.
     > 300 mg/L : Strong sewage.
  2. Chemical O_a Demand :
     Amount of chemical used to chemically detoxify the sewage.
     Pure oxidising agent is used.
     Chemical toxins are used with excreta.
  3. Suspended solids :
     Normal amount in sewage : 100-500 mg/L (~ ppm).
     <100 mg/L : weak sewage.
     >500 mg/L : Strong sewage.

Excreta disposal methods : Unsewered area

00:18:31

- Service types : Night soil collected & disposed by humans.
- Non service type :
  1. Bore Hole :
     Old, not used anymore.
     Width : 12 inches.
     Height : 4-8 m ~ 20ft.
     5-6 persons /year.

Active space

2. Dug well :

Width : 30 inches.

Height : 10–12 ft (3–4m).

5–6 persons, valid for 5 years.

Also known as pit latrine.

Exclusively for excreta, no other waste must be disposed to maintain optimum function.

3. Sanitary latrine :

Provision of water seal.

Types :

- Planning Research and Action Institute (PRAI) latrine.
- Research cum Action project Latrine.
- Sulabh Sauchalya.

Features :

1. Squatting plate (3 ft x 3 ft).
2. An S shaped bend pipe called trap with a water level of 2.5cm. It makes it sanitary, as it prevents bad odour from coming out or insects from going in.
3. Pipe connecting to main sewage of size 3 inch x 3 ft.

4. Septic tank :

Minimum capacity > 500 gallons.

Fecal matter stays inside the tank at the bottom and supernatant fluid above is treated.

Anaerobic digestion inside septic tank.

Aerobic digestion outside septic tank.

Depth : 5–7 ft.

Length : 2 x width.

For a new septic tank : Seeder is required (sludge from another functioning septic tank).

Distance from water surface to top of tank : 1–1.5 m.

5. Aqua privy :

Has complete water in the tank.

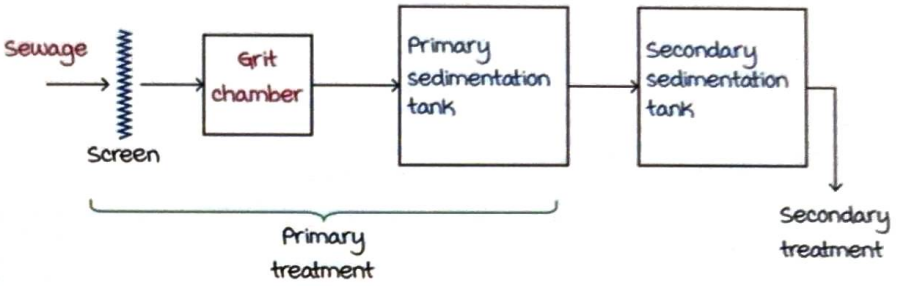
Anaerobic digestion of fecal matter.

Distance from water surface to top of tank : 1–1.5 m.

Excreta disposal methods – Sewer facility

00:31:30

- Sewage Treatment Plant (STP):
  Sewage goes through different processes.



Primary treatment:

Screen: Filters out metallic objects.

Grit chamber: Solid particles settle down.

1° sedimentation tank: Sewage stays for 6–8 hrs.
Reduction in coliform by 30–40%.

Secondary treatment:

- Can use:

1. Tricking filters (air treats sewage while passing through these filters).
   Consist of small rotating sprinklers from which supernatant liquid is thrown away.
   The water then percolates through the sandbed placed below the sprinkler.
   Principle: Air is present in between the sprinklers jets which will treat the sewage before it passes onto the sandbed.

60c6b3eeaa8ded0e4e7e5ea7

2. Activated sludge process.
   In 1° Treatment: Sewage is aerated for 6–8 hours.
   ↓
   Sewage settled down in 2° sedimentation tank is becomes activated sludge.
   ↓
   The activated sludge is taken back into aeration tank.
   ↓
   The sewage from primary goes into secondary and sludge from 2° goes into 1° forming a cycle.

Active space

Final liquid waste generated is given for agriculture and manure generation. Hence there is no waste production.

- Activated sludge / aeration sludge and aeration tank forms the heart of STP.

Other methods

00:41:07

1. Oxidation ditch : 1 acre.
2. Aerated lagoon : 2.5 acres.
3. Oxidation pond : 22 acres for 100,000 population.
   Require sunlight, air, bacteria and algae for its functioning.
   3–5 ft deep.
   Found in rural areas.
4. River / sea fallout (insanitary method).

ENTOMOLOGY : MOSQUITOES

Introduction

00:01:24

Entomology : study of insects.

Class insecta : mosquitoes, flies, lice, flea.
Class arachnida : Ticks, mites.
Class crustacea : Cyclops.
Cyclops are not of public health importance as they cause guinea worm disease which has been eradicated from India.

	Class insecta	Class arachnida	Class crustacea
Parts	Head, thorax, abdomen	Abdomen, cephalothorax	Abdomen, cephalothorax
Legs	3 pairs	4 pairs	5 pairs
Wings	Present (may/may not fly)	No wings	No wings
Habitat	Land	Land	Water

Modes of transmission :

60c6b3eeaa8ded0e4e7e5ea7

- By direct contact.
- Mechanical mode : Carries the organism (in foot pad).
- Biological mode : 3 types.
  1. Propagative transmission : Many number of same organism develop inside the vector.
     Example : Plague bacilli in rat flea.
  2. Cyclodevelopmental transmission : Change in shape/size/developmental stage of only one organism inside the vector.
     Example : Filarial worms in culex mosquito.
  3. Cyclopropagative transmission : Change in shape/size/developmental stage + change in number of organisms inside the vector.
     Example : Plasmodium in Anopheles mosquito.

Active space

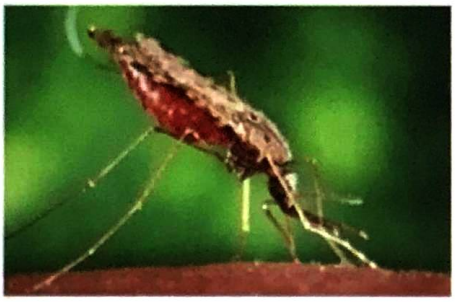
Mosquitoes

00:09:01

Predominantly seen are only 2 tribes of mosquitoes :
Family Anophelini : Genus Anopheles.
Family Culicini : Genus Culex, Aedes, Mansonia.

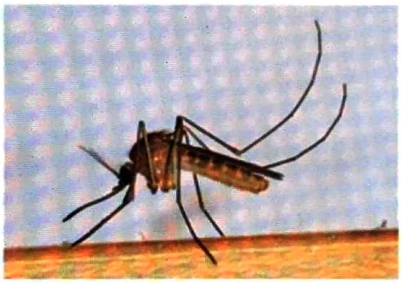
	Anopheles	Aedes	Culex	Mansonia
Disease	Malaria (highest deaths among vector borne diseases)	Dengue, yellow fever, chikungunya.	Japanese encephalitis, Lymphatic filariasis.	Lymphatic filariasis.
Breeding place	Clean stagnant water (road side water, pothole water)	Artificial stored water (household water like in coolers, flower pots, Collected rain water).	Dirty polluted water	Large water body with aquatic vegetations (pistia plants, water hyacinths)
Eggs	Single, boat shaped with lateral floats	Single, cigar shaped	Clusters, in rafts (sheets)	star shaped Clusters.
Larva	Near the water surface : Surface feeder (takes air by coming out of water)	Below the surface of water : Bottom feeder. Has siphon tube to breathe.	Below the surface of water : Bottom feeder. Has siphon tube to breathe.	Attach to roots of aquatic vegetations through siphon : Bottom feeder.
Biting time	Morning and evening (dawn to dusk biter). Peak is during dawn and dusk.	Peak is during day time : 2 hrs after sunrise and 2 hrs before sunset.	Peak is during midnight.	Peak is during morning and evening.
Habitat	Exophilic (outside the house)	Endophilic (inside the house on the walls, under table)	Usually exophilic. Endophilic during night time.	Exophilic
Bite	Relatively less painful	Painful (cannot be shoved off)	Stingy/burning bite	Relatively painless
Resting position	Head down position : Inclined/landing position	Parallel to ground	Head down position (because of neck)	Squatting position
Flight range	2 – 3 Km	100 – 200 m	11 – 13 Km	2 – 3 Km
Special feature	Spots on wings	Stripes on legs and body. Fast moving mosquitoes. Difficult to catch.	Brown colour, small body, big wings & causes buzzing.	Long legs, large body.

Anopheles mosquito :

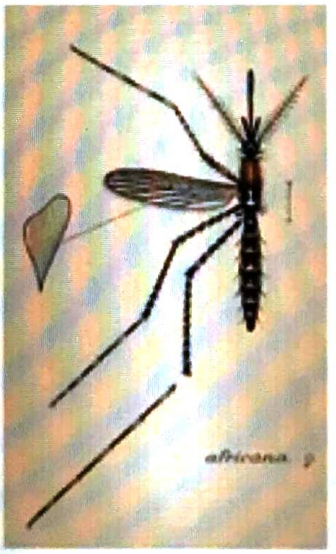


Aedes mosquito :

Culex mosquito :



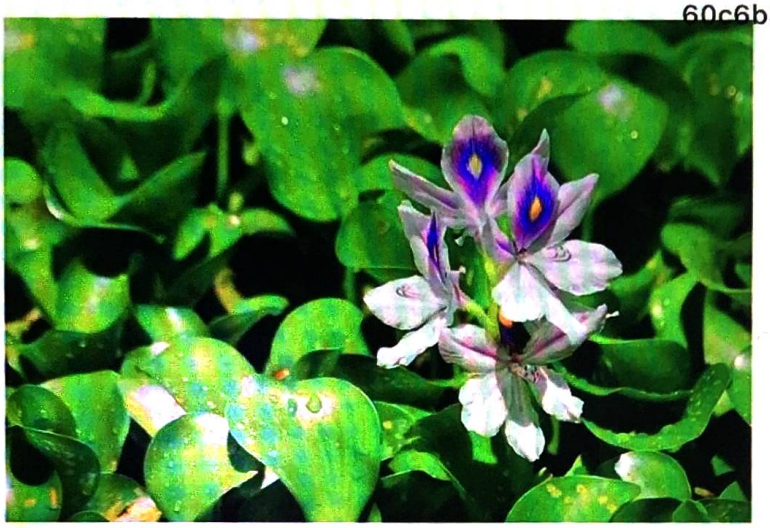
Mansonia mosquito :



Active space

Pistia plant (water cabbage)

60c6b3eeaa8ded0e4e7e5ea7



water hyacinth.

Active space

ENTOMOLOGY : LICE, TICKS, MITES & SANDFLY

Sandfly

00:00:27

Belongs to class Insecta (presence of wings differentiates it from class Arachnida & Crustaceae).
Differs from mosquito by presence of abundant hair.

Types of Sandfly :

Sand fly	Disease	Location
Phlebotomus argentipes	Kala azar (included in NVBDCP)	Bihar, West Bengal, Orissa, Uttar Pradesh, Assam.
Phlebotomus papatasi	Sand fly fever	
Phlebotomus sergenti	Oriental sore	
Phlebotomus punjabensis	Sand fly fever	

Special features :
Hairy insect.
1.2 – 2.5 mm in size.
Nocturnal insect (bites at night).
Shape of wings : Lanceolate.
It does not fly but hops to a maximum of 40 – 50 yards.
Has a predilection for lower limbs and it's bite is painful.
Lives in cool damp places like burrows.

Prevention & control modalities :
Sand fly is killed by DDT & BHC.
Insecticide of choice under NVBDCP (National Vector Borne Disease Control Programme) : Malathion or Synthetic pyrethroids (Insecticide of choice).

Louse/Lice

00:05:39

Special Features :

Elongated, wingless ectoparasite.

3 pairs of legs with claws (class Insecta).

Class Arachnida has 4 pairs of legs & class Crustaceae has 5 pairs of legs.

Types of louse :

- Head louse.
- Body louse.
- Pubic louse : Strongest.

Dorsoventrally flattened.

Antenna : Straight.

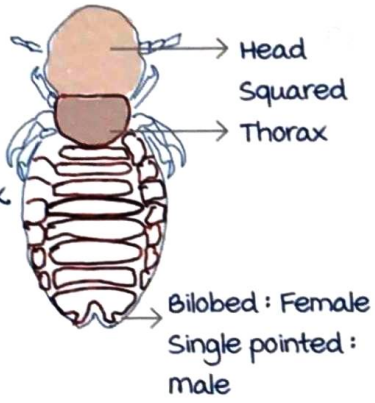
Body has a head, squared thorax, abdomen : 9 segments.

Last segment of abdomen,

If bilobed : Female.

If single pointed end : male.

Class Arachnida has cephalothorax.



60c6b3eeaa8ded0e4e7e5ea7

Public health importance : Louse borne diseases.

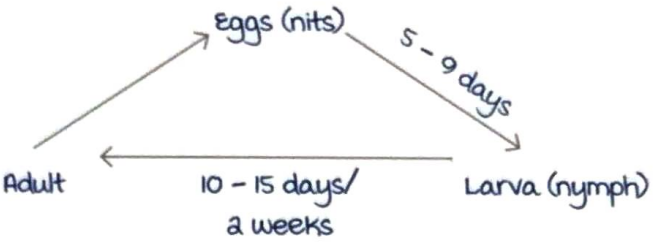
Mnemonic : RETD.

Disease	Causative organism
Relapsing fever	Borrelia recurrentis
Epidemic typhus	Rickettsia prowazekii
Trench fever	Rickettsia quintana
Dermatitis	multiple organisms

Mode of transmission : Through direct contact or fomites.

Active space

Life cycle of louse :



Adults will lay ~300 eggs in a lifetime at 4 – 9 eggs/day.
Life span of an adult louse : 1 – 2 months.

Prevention & control measures :
Can be killed by any insecticide.
0.5 % malathion for head louse.
Carbaryl dust for head louse.
Suspectible to DDT/BHC also. Used during lice epidemic.

Flea

00:13:58

Special Features :
Wingless ectoparasite.
3 pairs of legs with claws facing backwards (class Insecta).
Antenna face backwards.
Body : Head, thorax, abdomen (9 – 10 segments).
Bilaterally flattened.

Bites are painful & unispecies (specific for each species).

Types & their public health importance :

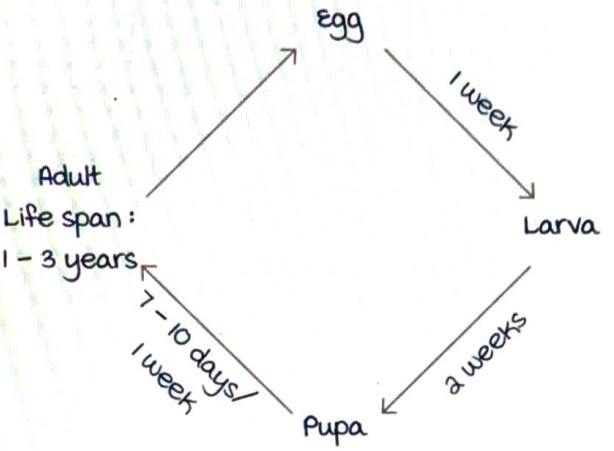
Flea	Species	Disease
Rat fleas (oriental)	Xenopsylla cheopis Xenopsylla astia Xenopsylla brasiliensis	Plague
Human fleas	Pulex irritans	Trench fever (louse > flea)
Sand flea	Tunga penetrans. Seen predominantly around Rajasthan.	Can enter nail beds and cause ulcer. Dermatitis, ulcer/gangrene in lower limb toes.

Rat flea : Causes plague by propagative transmission.
Transmitted by a blocked rat flea that bites alternate hosts.
Danger : Partially blocked flea > blocked flea (blocked flea will have short life span).

Mode of transmission : Through bites or mechanical transmission (Tunga penetrans).

Life cycle of fleas

00:22:56

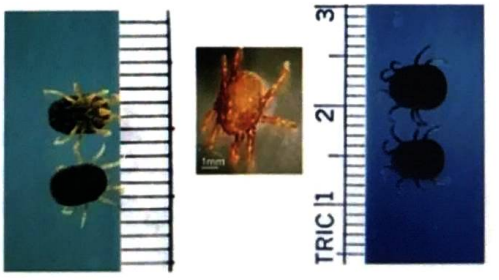


Prevention & control measures :
Susceptible to DDT/BHC (not used in national programmes).
5% Malathion.
2% Carbaryl dust.
Personal protection using diethyl toluamide, benzyl benzoate.

Ticks :
Special features :

60c6b3eeaa8ded0e4e7e5ea7

- No wings.
- 4 pairs of legs (class Arachnida).
- Can be a tick/ mite.
- Fused cephalothorax & abdomen.

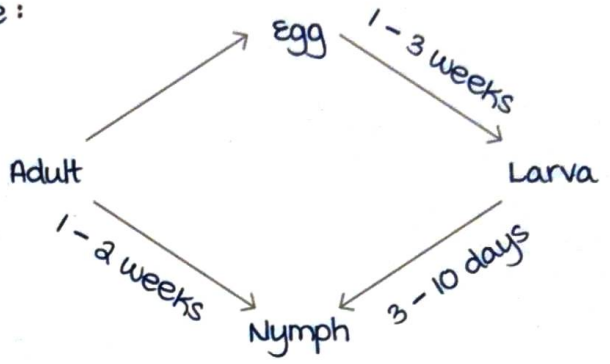


Active space

Hard tick

Soft tick

Life cycle :



Types of ticks

00:28:38

Hard Tick	Soft Tick
Rapid life cycle. Becomes adult in 2 months.	Becomes adult in 9 - 10 months
Has chitin on its exoskeleton	No chitin
Head is visible	Head is not visible
Always on the host (feeds all the time). Will die once out of body.	Nocturnal feeding. Can starve for weeks/ months.

60c6b3eeaa8ded0e4e7e5ea7

Diseases of public health importance :

Hard tick (Ixodidae)	Soft tick (Argasidae)
Tick typhus. Tick Paralysis. Tularemia. Viral encephalitis. Viral fever. Viral hemorrhagic fever. Babesiosis.	Q fever. Relapsing fever. Kyasanur forest disease (can be caused by hard tick as well).

Active space

Prevention & control :

Personal protective measures : Proper clothing & usage of benzyl benzoate.

Mites 00:34:06

Special features :

4 pairs of legs (class Arachnida)

Thick & long anterior legs.

2 types :

Itch mite

Trombiculid mite

Trombiculid mite/ berry bug :

Infective & biting stage : Larva.

Adult lives in the soil.

Transovarian transmission : Infected larva develops into an infected adult which lays infected eggs that further develops into an infected larva and the cycle continues.

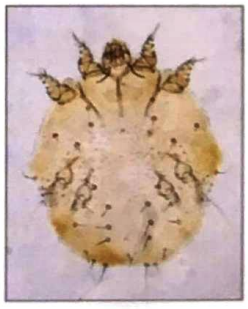
Public health importance : Rickettsia orientalis (Orientia tsutsugamushi) causes Scrub typhus (especially hill stations).

Itch mite/ Sarcoptes scabiei :

Special features :

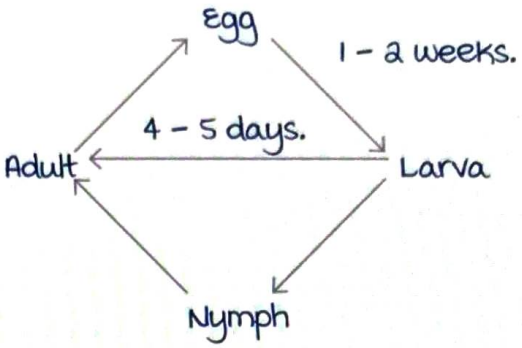
4 pairs of legs.

Thick anterior legs & thin posterior legs.



Active space

Life cycle : Short.



Total life span from egg to adult : 10 – 15 days.
Disease of public health importance is Scabies.

Scabies

00:40:07

Itch mite burrows through the interdigital spaces and stays there. They are called ovigerous burrows/ tunnels. Comes out at night due to vasodilation (because hands are kept inside the blanket during sleep, generating heat causing vasodilation) and leads to intense itching at night/ after hot baths.

Scabies is due to unhygenic conditions. Has a rapid life cycle.
Mode of transmission : Through direct contact or fomites.

Prevention & control measures :
25% Benzyl benzoate (DOC) : 2 – 3 times a week.
HCH/ Lindane : Twice a week.
Others : Permethrin, Crotamiton, Tetmosol ointments.

Tick		mite	
Hard tick	Soft tick	Itch mite	Trombiculid mite
Oval shaped & has 4 pairs of legs			
Head is visible	No visible head. Bullous (balloon shaped) creature.	Thick anterior legs.	Head visible. 8 shaped creature with longer legs.

MOSQUITO CONTROL MEASURES AND INSECTICIDES

Insecticide formulations 00:00:28

- Spray :
  Used in solution form.
- Mist/Fog :
  Used in solution form.
  No residual action. So, also called space spray.
  Ultra low volume fogging (ULV – fog) :
  It's better due to lesser side effects (lesser respiratory problems).
  Have very fine particles of mist.
- Suspensions :
  Dissolve solid particles of insecticides in solvents.
  Slightly longer residual action.
- Emulsificants :
  It is mixed with paint.
  Has longer residual effect.
- Dust/ Granules :
  Used against larvae of Culex/ Mansonia.

Mosquito control measures :

Integrated Vector Management (IVM) :

1. Source reduction : Remove the appropriate water source. One of the best methods of vector management.
2. Anti – larval measures.
3. Anti – adult measures.
4. Personal protection measures.

Anti larval methods 00:07:07

- Physical methods.
  Oil : Mosquito Larvicidal Oil (MLO). Forms a special film

over the water surface and cuts off the air supply to the larva, asphyxiating it.

Highly effective for Anopheles larvae.

Disadvantages : Expensive.

Makes water unfit for drinking/ fishes.

MLO should always be there for >8 days.

- Chemical methods
  1. Paris green:

     Stomach poison.

     Emerald green color poison.

     Chemical : Acetoarsenite.

     Used at the rate of 1 Kg/Hectare.

  2. Abate :

     Brownish liquid/ powder/ granules.

     Scientific name : Temephos.

     Causes organophosphorous toxicity : Contact poison.

     Sprayed at rate of 50 - 100 g/Hectare.

     Better method than paris green.

- Biological methods.

  Fish : Gambusia affinis.

  Poecilla reticulata (Guppy/ Barbados millions fish).

Gambusia affinis : Larvivorous.

Poecilla reticulata

BTi (Bacillus thuringiensis) : Kills larva.

Anti adult measures

00:13:56

Two ways :

Spray with residual action (Residual spray)

Spray without residual action (space spray) : Fogging

Active space

Dichloro Diphenyl Trichloro ethane/ DDT :

White amorphous powder.

Organochlorous toxins (Active component - Para - para isomer).

(Organochlorous toxins are usually in powder form and organophosphorus in liquid form)

Insoluble in water.

Soluble in other solvents.

Takes few hours to kill the mosquito.

Contact poison.

Residual action : 5 - 7 months (maximum of 18 months).

Disadvantages : Biomagnification.

(DDT enters into food chain and humans at top of food chain will suffer).

Restricted use of DDT by WHO now.

Spray rate: 100 - 200 mg/ sq. ft area every 6 months.

Malathion :

Alternative to DDT.

Organophosphorous (OP) poison.

Contact poison.

Has least toxicity among all OP toxins.

Yellow/ brown liquid with unpleasant smell (Powder form can also be used).

Has anti larval, anti adult action.

Used in ULV - fogging.

Effective for roughly 3 - 4 months.

Usually sprayed every 3 months.

Spray rate : 100 - 200 mg/ sq. ft area every 3 months.

Fenthion 00:22:28

Most potent anti larval method.

Also used as anti adult residual spray.

Organophosphorus toxin.

Contact poison.

Brown colored liquid with unpleasant garlic odor.

Spray rate : 100 mg/sq.ft area.

Active space

Benzene Hexachloride (BHC) :

Also called as Hexa chlorohexane.

Organochlorine compound.

White to light brown colored powder.

Has musty smell.

Active component : Gamma isomer.

Purest form of BHC has 99% Gamma isomer :

Gammaxene/ Lindane .

Potent insecticide.

Used against mosquitoes, sandflies.

Time duration : 3 months.

Rate : 50 mg/ Sq.ft area.

Pyrethrum :

Natural alkaloid.

Derived from 'Chrysanthemum cineraria folium'.

Highly expensive chemical.

Potent contact poison.

Used as space spray.

Spray rate : 0.5 – 1 ounce/ cubic feet.

- Synthetic pyrethroids :

  Deltamethrin

  Cyfluthrin.

  Permethrins (also used in Scabies).

National Vector Borne Disease Control & Prevention (NVBDCP) :

malathions/cyfluthrin used in Kala azar.

Personal protection measures 00:30:36

- Bed nets.

  Hole size < 1.2 sq. mm

  Area : 0. 0467 sq. inch.

  100 – 200 holes per sq. inch.

Two types :

Standard bed nets.

Insecticide treated nets (ITN).

LLITN : Long Lasting Insecticide Treated Nets.

Last > 6 months.

Deltamethrin used in LLITN.

- Clothing.
- Mosquito repellants : Active component is DEET (Di Ethyl Toluamide). Synthetic pyrethroids are also added.

Summary table :

Classification		Insecticides
Stomach poison		Paris green, Sodium fluoride.
Fumigants		Hydrogen cyanide, methyl bromide, Sulfur dioxide, Carbon disulfate.
Contact poison (Synthetic)	Organochlorine	DDT, HCH (BHC), Lindane, Chlordane, Heptachlor, methoxychlor, Dieldrin, Aldrin, Toxaphene, Kepone and Mirex.
	Organophosphorus	Chlorthion, Malathion, Diazinon, Parathion, Methyl Parathion, Fenthion, Fenitrothion, Dioxathion, Dichlorvos, Chlorpyrifos, Ronnel, Gardona.
	Carbamates	Carbaryl, Propoxur, Dimetilan, Pyrolan.
Contact poison (Natural)		Pyrethrum, Rotenone, Derris, Nicotine and Mineral oil.
Synthetic pyrethroids		Resmethrin, Bioresmethrin, Polythnin, Tetramethrin, Resethrin, Proparthin and Prothrin.
Repellents		Benzyl benzoate, Indalone, meta diethyltoluamide, Dimethylphthalate.

Insecticides	Rate of spray
MLO	40 – 90 L / hectare of water area
Paris green	1 Kg / hectare
Abate	50 – 100 g / hectare
Fenthion	100 mg / sq ft
malathion	100 – 200 mg / sq ft
DDT	100 – 200 mg / sq ft
BHC	25 – 50 mg / sq ft
Pyrethrum	0.5 – 1 Ounce per cu ft

Rodenticides

00:36:38

1. Metal phosphides :
   - Zinc phosphide : most commonly used
   - Aluminium Phosphide (Celphos) : Highly potent toxin.

   Phosphides release phosphine gas (Cannot be metabolised by the body, if in huge amounts).

   Kills rat in 30 min – 3 hours.

   Bait made in Ratio 1 : 10 flour.
2. Barium carbonate :

   Used in Ceramics.

   Kills in 4 – 24 hours.

   Not very effective.
3. Norbormides.
4. Red squill : Natural product (From flower).

Insecticide toxicity :

Organochlorine compounds :

Nerve toxin.

Causes convulsions, seizures, neuropathy.

Antidote : Barbiturates.

Organophosphorus compounds :

Inhibits cholineesterase & raises acetycholine levels.

Parasympathetic features : Increased salivation, urination, cardiac effects.

Antidote : Atropine.

OCCUPATIONAL HEALTH

Thermal injuries

00:01:22

Failure of heat regulation : No sweating.

- Heat stroke : 108 – 110° F.
  Skin would be very hot and dry.
- Heat pyrexia : 104 – 106° F.
  Milder form.

Treatment : Rapid cooling.

Salt and water imbalance :

- Heat exhaustion :
  Water loss → Dehydration.
- Heat cramps :
  Salt loss due to excessive sweating.

Treatment : Solute based rehydration.

Impaired vascular pressure :

- Heat syncope :
  Vasodilation of blood vessels → Pooling of blood in lower extremities → Reduced cardiac filling.
  Tachycardia and hypotension.

Cold injuries :

Trench foot :

- Immersion of feet in very cold water/ice/snow.
- Causes vasospasm.
- Swelling of feet.

Frost bite :

- Crystallization of body fluid, usually in extremities.
- Rx : Rewarming of the body part at 42°C for 20 – 30 minutes.

Pneumoconiosis

00:10:22

Usually restrictive type of lung diseases.
Occupational related.

Silicosis	Silica	Sand stone industry, granite, pottery & ceramic industry, gold, mica & steel industry.
Asbestosis	Asbestos	Asbestos cement factory, fireproof textiles.
Siderosis	Iron	Iron ores & mines, iron & steel industry.
Anthracosis	Coal dust	Coal mines.
Aluminosis	Aluminium	Aluminum industries.
Baritosis	Barium	Photography, printing, barium diagnostic works.
Lithosis	Stone	Stone industries.
Byssinosis	Cotton dust	Textile industries.
Bagassosis	Sugar cane dust (Bagasse)	Cane sugar factories, paper & cardboard factories.
Tobaccosis	Tobacco dust	Tobacco factories (beedi, cigar and cigarette).
Farmer's lung	Mouldy hay (grain dust)	Agricultural industry.

Silicosis and asbestosis :

Silicosis	Asbestosis
Silica dust.	Asbestos fibre.
Affects the upper part of lung.	Affects the lower part of lung.
Enters alveoli causing alveolitis.	Causes bronchiolitis.
Snow storm appearance in X ray. Nodular fibrosis.	Ground glass appearance in X ray. Diffuse fibrosis.
Not premalignant.	more premalignant : Bronchial cancers.
High chance for developing TB.	mesothelioma has strongest association.

Byssinosis

00:18:14

Due to cotton fiber dust.

Seen in lower zones of the lung.

Bagassosis :

Bagasse : Remnant of sugarcane.

Thermoactinomyces sacchari : A fungus that grows on the bagasse, is the cause.

Mottling of lung can be seen.

Farmer's lung :

Micropolyspora faeni : Fungus in mouldy hay, is the cause.

Occupational cancers :

Skin cancer (most common) : Squamous cell cancer.

Lung cancer common in heavy metal industry.

- Squamous cell cancer.
- Risk increases if the person is a smoker.

Bladder cancer : Benzene and aromatic amines.

- Textile industry.

Cancer	Carcinogen
Skin cancer	Anthracene, coal tar, soot, pitch, oils & dyes, UV rays, X rays.
Lung cancer	Arsenic, beryllium & isopropyl oil, chromium, cobalt, tobacco, coal tar, nickel.
Bladder cancer	Beta naphthalene, benzidine, auramine, aromatic amines, hemotoxins.
Leukemia	Benzene, ionizing radiation (X rays, gamma rays), radioactive isotopes.

most common agents	Cancer
Benzene, ethylene oxide	Leukaemia, bladder cancer.
beryllium, cadmium, chromium, radon, silica, ionizing radiation, PAH, nickel (heavy metals)	Lung cancer.
Asbestos	Mesothelioma. MC cancer is bronchial cancer.
Arsenic	Skin, lung, liver cancer.
Benzidine, aromatic chemicals, taxtile, dye industry	Bladder cancer.
PAH	Skin, scrotum and lung cancer.
Vinyl chloride	Liver cancer.
Wood dust, nickel, chromium	Nasal & sinus cancer.

Caplan syndrome

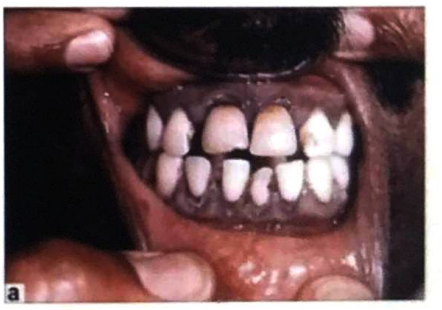
00:26:30

Seen in workers in construction and mining.
Pneumoconiosis along with rheumatoid arthritis,
with / without intrapulmonary nodules / fibrosis.

White finger syndrome :
Seen in construction workers operating heavy machinery.
Vibration injury.
Vasospasm in fingers and hand : Loss of sensation and pallor.
Related with Reynaud's phenomena.

Plumbism :
Lead toxicity.
Also called Painter's colic.
MC route : Inhalational.
MC route in children : Ingestion.
MC industries involved are

- Battery.
- Automobile.
- Paint.
- Toy.



Plumbism

Pathophysiology :

- Lead interferes with porphyrin metabolism.
  Inhibits ferro chelatase, ALA dehydratase enzymes.
  Urinary excretion of coproporphyrins and ALA.
  Causes anemia.
- Binds with calcium and calmodulin & interferes with the neurological functions.

Clinical features : Mnemonic- ABCDEF

60c6b3eeaa8ded0e4e7e5ea7

Anemia : Facial pallor.

Burtonian line : Blue line on gums due to lead deposition.

Basophilic stippling of RBCs.

Abdominal colic.

Foot and wrist drop.

Encephalopathy, memory deficits.

Facial pallor.

Diagnosis of plumbism

00:34:31

- Screening tool :
  Urinary coproporphyrin III levels.
  Urinary ALA levels (more reliable).
  Urinary ALA normal level : 1 – 6 mg/24hours.
  In plumbism : > 70 mg/24hours (10 times increase or more).
- Confirmatory : Blood lead levels.
  Normal : < 10 mcg/dL.
  Occupational exposure : ~ 40 mcg/dL.
  Onset of symptoms >70 mcg/dL : Treatment should be initiated.

Treatment : Lead chelation.

- Succimer.
- D penicillamine.
- Dimercaprol.
- Ca Na_2 EDTA (not used alone).

Active space

Decompression sickness :

Seen in deep sea divers.
Solubility of gases increase in high pressure (deep sea).
Rapid ascension from deep sea, the nitrogen dissolved in the blood forms into bubbles.

Type 1 :

- milder form.
- Joint involvement.
- more edema.

Type 2 :

- Severe form.
- Pulmonary edema, brain infarcts, syringomyelia, cardiovascular effects.

Treatment : Hyperbaric oxygen.
Can be prevented by slow ascent.

Acute mountain sickness

00:42:36

>2500 m without acclimatization.
Higher altitude has low partial pressure of oxygen → $\downarrow O_a$ in inhaled air → Hypoxia → Increases ventilation drive → Alkalosis.

HAPE : High altitude pulmonary edema.

- Low oxygen partial pressure → vasoconstriction in pulmonary circulation → hypoxia → alkalosis.

HACE : High altitude cerebral edema.

- Hypoxia → vasodilation of brain → cerebral edema.
- HAPE causes HACE.

Treatment : 100% oxygen & slow ascent → 200 – 300 m/min.

Prevention of occupational diseases :

Medical	Engineering	Legislation
Pre placement medical examination	Structure	Factories act, 1948
Periodic examination	House keeping, occupational sanitation	ESI act, 1948
Notification of diseases	Ventillation, dust control, substitution, mechanization	
Health records, analysis	Protective equipments	
Health education and preventive services		

60c6b3eeaa8ded0e4e7e5ea7

Sickness absenteeism

00:48:56

Sensitive indicator for occupational health of employees.

$$\frac{\text{Total number of worker days absent}}{\text{Total number of worker days}} \times 100$$

Higher the sickness absenteeism, lower is the occupational health of the workers.

Pre-placement examination :

Industries	Pre employment screening
Lead	Anemia, hypertension, nephritis and peptic ulcer.
Dyes	Asthma, skin, bladder & kidney diseases and precancerous lesions.
Solvents	Liver & kidney disease, dermatitis and alcoholism.
Silica	Pulmonary TB (healed /active), chronic lung disease.
Radium & X ray	Blood disorder.
Food handlers	For communicable diseases, hepatitis, typhoid, contagious diseases.

Active space

Periodic medical examination :

Usually done annually for all occupations.

Monthly checkups :

- Lead industries.
- Dye industries.
- Radium and ionizing radiation producing industries.
- Heavy chemicals.

Daily checkups :

60c6b3eeaa8ded0e4e7e5ea7

- Dichromate using industries.

Event based checkups :

- Preflight medical checkups.

Prevention of occupational diseases in health professionals

00:42:35

Health professionals are exposed to :

1. Occupational infections :
   - Hepatitis B, hepatitis C, HIV.
   - Needle stick injury.
   - Unsafe patient handling.
   - Musculoskeletal diseases.
2. Exposure to hazardous chemicals :
   - Disinfectants, detergents, chemicals, mercury.
   - Inhalation of the same : Can cause new onset asthma.
3. Exposure to radiation : Ionizing radiation, UV radiations.
4. Occupational stress and burn out.
5. Violence and harassment.
   - Verbal abuse, physical abuse.
6. Occupational injuries.
7. Environmental health hazards.

Occupational health institutes :

Institutes	Location
National Institute of Occupational Health	Ahmedabad (Gujarat)
Central Labor Institute	Mumbai
Regional Labor Institute	Kanpur, Kolkata & Chennai
Central Mining and Research Station, CSIR	Dhanbad (Bihar)
Industrial Toxicology Research Centre	Lucknow
National Environmental Engineering Research Institute	Nagpur (Maharashtra)

Apex institute : National Institute of Occupational Health, Ahmedabad, Gujarat.

BIOMEDICAL WASTE MANAGEMENT

Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals.

Handling of biomedical waste system in India :
1986 : Environment protection act.
1998 : Biomedical waste management guidelines.
2016 : Biomedical waste management guidelines (amendment), 2016.
27th March, 2019 : Government of India banned the use of chlorinated bags.
2020-2021 : COVID management guidelines.

Biomedical waste management guidelines (2016) was made by Central Pollution Control Board (CPCB). It is under the Ministry of Forest, Environment and Climatic change.

Common Biomedical waste Treatment Facility (CBWTF) : medical waste segregation is done at the same site where waste is generated. It is then sent to a common area at the hospital. A person from CBWTF picks up the segregated medical waste in an authorized transport vehicle. At CBWTF, disposal/ treatment of medical waste is done.

There are four categories of waste : Yellow, red, blue and white. Pretreatment is not required to be done in the hospital except in certain situations.

60c6b3eeaa8ded0e4e7e5ea7

Following are not considered under biomedical waste :

Waste	Covered under
Solid waste	Solid waste management rules, 2016.
60c6b3eeaa8ded0e4e7e5ea7 E waste	E-waste (management rules, 2016).
Radioactive wastes	Atomic energy act, 1962.
Hazardous chemicals	Manufacture, storage and import of hazardous chemicals rules, 1989.
Construction and demolition waste	Construction and demolition waste management rules, 2016.
Lead acid batteries	Batteries (management and handling) rules, 2001.
Hazardous wastes	Hazardous and other wastes (management and transboundary movement) rules, 2016.
Hazardous microorganisms, genetically engineered microorganisms and cells	Manufacture, use, import, export and storage of hazardous microorganisms, genetically engineered micro organisms or cells rules, 1989.

Symbols

00:10:48

Biohazard waste :

Cytotoxic waste :

Active space

Radiological waste (not under biomedical waste) :

Biomedical waste categories :

Yellow : ± Infectious (may or not be pretreated) ⟶ Goes for incineration.

Red : ± Infectious rubber/plastic/tube (No pre treatment) ⟶ Goes for recycling or reuse.

Mnemonic : RPT for Rubber/plastic/ tube & reuse, no pre treatment , recycle.

Blue : Glass (no pre treatment)⟶ Goes for recycling or reuse.

White : Sharps (no pre treatment)⟶ Goes for recycling or reuse after shredding.

Some examples :

Blood bags including blood transfusion set	Yellow
Urine bag	Red
Ortho metallic implants	Blue
Needles, scalpels	White
Gloves contaminated with HIV blood (Any glove stained/unstained)	Red
Blood from the syringe goes into yellow, and syringe	Red
Syringe with fixed needle system	White

Immunization waste :

- Wrapper/cover goes into black category (municipal waste).
- Vaccine vial goes into blue category.
- Needle goes into white category after destruction.
- Syringe goes into red category.
- Live vaccines go into yellow category.

Active space

Yellow category

00:21:12

8 sub categories : 60c6b3eeaa8ded0e4e7e5ea7

Yellow (a) – Human/anatomical waste :

Human tissues, organs, body parts, fetus below viability period, placenta and extracted tooth.

Yellow (b) – Animal anatomical waste :

Animal carcasses, body parts, organs, tissues, waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.

Yellow (c) – Soiled waste :

Items contaminated with blood/body fluids like dressings, plaster casts, cotton swabs & bags containing residual or discarded blood & blood components, used infectious material such as caps, shoe cover, blotting paper/gauze, wooden swab stick paraffin blocks, indicator tapes & disposable (single use non-linen based) masks & gowns.

Yellow (d) – Expired and discarded medicines :

This contains :

Expired or discarded medicines (with biohazard symbol).

Cytotoxic drugs : Separate bags are used for cytotoxic drugs (anticancer drugs) which can be sent back to the pharmaceutical for remanufacturing. The cytotoxic waste symbol is used for these drugs.

Yellow (e) – Chemical waste (solids/liquids) :

Chemicals used in production of biological, discarded containers of chemicals and disinfectants etc.

Includes solid or liquid residual chemicals used in HCFs (Health Care Facilities).

Yellow (f) – Chemical liquid waste (fluids) :

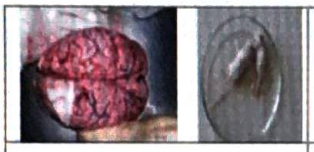
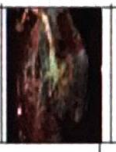
- X- ray film liquid : Not radioactive waste. Contains $AgNO_3$. Used for developing films. The liquid is recycled by the manfacturing company.
- Liquid chemicals (detergents) from lab, floor washings, cleaning, house keeping and disinfecting activities etc.

Active space

- Infected secretions/aspirated body fluids such as ascitic fluid, pleural fluid, CSF, sputum, feces, urine, saliva except blood.

Yellow (g) : Discarded linen, mattresses, beddings contaminated with blood, body fluids, routine mask and gown.

Yellow (h) – Biotechnology, microbiology and other clinical laboratory waste :
Microbiology, biotechnology lab waste.
Other clinical laboratory waste, waste blood bags (containing date expired or contaminated blood), vacutainer with blood.
Laboratory cultures, stocks or specimen of micro-organisms, live or attenuated vaccines, human cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.

<table>
<tr><td colspan="2">  </td><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td colspan="2">Human & animal anatomical wastes (yellow a)</td><td>Placenta (yellow a)</td><td>Foetus (yellow a)</td><td>Soiled waste (yellow c)</td><td>Discarded linen & beddings (yellow g)</td></tr>
<tr><td colspan="2">  </td><td>  </td><td colspan="3">  </td></tr>
<tr><td colspan="2">Expired / discarded medicines (yellow d)</td><td>Cytotoxic drugs (yellow d)</td><td colspan="3">Microbiology, Clinical laboratory, Biotechnology waste including blood bags &blood samples (Pre treat in autoclave safe plastic bag/microwave/ non chlorinated chemical disinfection) (yellow h)</td></tr>
<tr><td colspan="2">Silver x ray film developing liquid</td><td>Infectious liquid waste</td><td colspan="3">Silver x ray film developing liquid</td></tr>
<tr><td colspan="2">  </td><td>Infected secretions: Sputum / faces / urine / serum. Aspirated body fluids: pleural / peritoneal/ CSF / synovial fluid.</td><td colspan="3">  </td></tr>
</table>

The fluids are in the yellow f category.

Red category

00:32:24

- Tubing, bottles, intravenous tubes and sets.

- Catheters, urine bags.
- Syringes (without needles and fixed needle syringes with their needles cut).
- Vacutainers (without blood) and gloves.
- Waste pipette tips, plastic pipette, rubber teats, drains, oxygen mask, thick plastic splash proof gowns, rubber apron, ELISA plate and vials not containing blood samples.

Vacutainer with blood goes into yellow category.

Foley's Catheter | Urosac Bag | IV bottle & Drip set | Heavy duty rubber Gloves & surgical gloves | Syringe without needle | Vacutainer | Ryles Tube

White category :

- Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts.
- This includes waste sharps such as lumbar puncture needle, trocar cannula, IABP cannula, arthroscopy blade, insulin pen needle, lancet needle, eye needle, cardioplegia needle and surgical stab knife.

Scalpels | Razor | Suture | Syringe with needle | Lumbar puncture needle | Needles from syringe

Blue category :

- Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.
- This includes glass slides and glass pipettes, metal sternal wire, Gigli saw wire and orthopaedic splints and implants.

Broken glass | Broken ampoules | Empty vial | metallic body implants, screws & plates

Active space

Pretreatment :

Pretreatment is done only for yellow (f), yellow (g) and yellow (h) categories.

- In Yellow (f), silver X-ray film liquid does not require pretreatment, it only needs to be sent for recovery. Disinfectant is neutralized using acids/alkali. Infected secretions are pretreated with 5% phenol/hypochlorite solution.
- In yellow (g), soiled linens are cut and disinfected using 5% phenol/hypochlorite solution.
- In yellow (h), microbiological/biotechnological wastes are pretreated using chemical methods (hypochlorite/phenol), mechanical (autoclave, hydroclave, microwave).

Category	Component	Pre-treat	CBWTF	No CBWTF
Yellow (a)	Human	Nil	Incinerate	Plasma pyrolysis/ deep burial
Yellow (b)	Animal	Nil	Incinerate	Plasma pyrolysis / deep burial
Yellow (c)	Soiled	Nil	Incinerate	Plasma pyrolysis / deep burial
Yellow (d)	Discarded medicine	Nil	Back to pharma	Manufacturer
Yellow (e)	Chemical	Nil	Incinerate	Incinerate
Yellow (f)	X-Rays	Nil	Recovery	-
	Disinfectant	neutralize	Effluent	-
	Infected secretions	Pre-treat	Effluent	-
Yellow (g)	linen	Cut and disinfect	Incinerator	Cut/disinfect/ incinerate
Yellow (h)	micro/ biotech	Pre-treat	Incinerator	Plasma pyrolysis/ deep burial

Bags and bins in biomedical waste guidelines 00:40:54

Yellow category : Bag (biohazard and cytotoxic symbols).
Red category : Bag (biohazard symbol).

White category : Puncture proof translucent/transparent bin.
Blue category : Cardboard bin or blue colored plastic bin.

Bag should be > 0.5 micron thick and non-chlorinated.
For covid : Bag should be double layered and labelled as 'COVID waste'.

COVID waste handling guidelines (revision 4 on Sept, 2020) :

COVID isolation/ward :
General solid waste : Should be collected separately as per solid waste management guidelines.

- Waste comprising of wrappers or medicines/syringes.
- Fruit peel offs, empty juice bottles or tetra packs, used water bottles, discarded papers, carton boxes of medicines, empty bottles of disinfectants, leftover food, disposable food plates etc.

Yellow category :

- Health staff : Used mask (including triple layer mask, N95 mask etc.), head cover/cap, shoe cover, disposable linen gown, non plastic/semi plastic coverall.
- Covid patient : Used masks, tissues and toiletries etc.

Red category : Used PPEs such as goggles, face shield, splash proof apron, plastic coverall, hazmat suit, nitrile gloves.
White category : Sharps, metals.
Blue : Glass, broken ampules.

COVID care at home/quarantine facility :

General Waste	Biomedical waste (Yellow Bags)
• Waste generated from kitchen. • Packaging material, waste food material, waste papers, waste plastics, floor cleaning dust, etc. • Leftover food, disposable utensils, water bottles, tetra packs, used by suspected quarantined persons or covid patients in home care.	• Used syringes, date expired or discarded medicines, empty ampules. • Used masks/gloves by covid patient, health staff. • In case of patients with other chronic diseases may also include drain bags, urine bags, body fluid or blood soaked tissues/cotton.

The wet and dry solid waste bags should be tied securely

(gooseneck tie) in leak proof bags, sprayed with sodium hypochlorite solution and handed over to authorized waste collector.

Yellow colored bags should not be used for collecting general solid waste.

Compostable bags should be used for collecting wet waste.

Faeces/excreta :

- Diaper/cloth : Yellow bag/container.
- Bed pan : Clean with detergent, disinfect with 0.5% chlorine solution.

Standards of biomedical waste treatment 00:50:06

Vacuum autoclave :
121 ° C /15 psi /45 mins.
135 ° C /31 psi /30 mins.

Gravity flow autoclave :
121 ° C /15 psi /60 mins.
135 ° C /31 psi /45 mins.

Microwave :

Indicator : Bacillus atrophaeus spores strips with 104 spores per strip.

Incinerator :

Temperature is 800–1050°C in the commonly used incinerator.

Types :

- Pyrolytic chamber : Temperature is > 1300°C.
- Single/double chamber. Mostly used : double chamber.

Not used in an incinerator : Pressurized gas cylinders, reactive chemicals, sharps, heavy metals.

Standards for incinerator :

- Temperature should be maintained between 800–1100°C.
- For discarded or expired medicines, temperature should be > 1200 ° C (inorder to achieve complete combustion).
- Combustion efficiency (CE) should be > 99%.

$$CE = \frac{\%\ CO_a}{\%\ CO_a + \%\ CO} \times 100$$

- Gross volume reduction of the waste > 85–95%.
- Pre-treat as per rules.

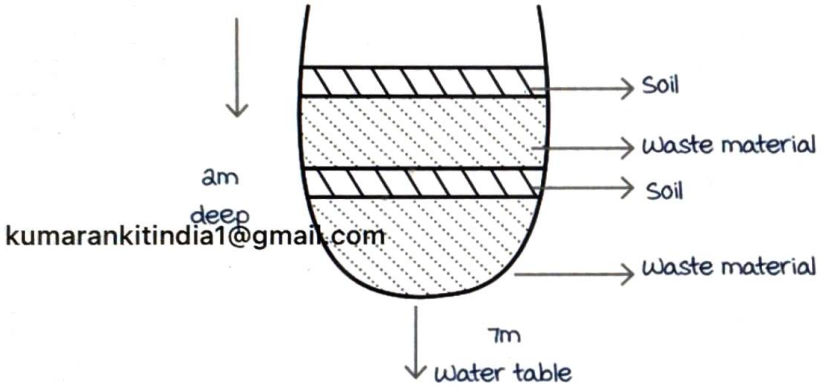
In rural area or if there is no access to CBWTF :

If area is > 75 kms away : Special approval from Director health service/ local area in charge to have alternate measures (burials/sharp pits).

Wastes could be dressings/placenta/fetus/immunization waste (syringes, needles, vials, cotton swabs)/animal/ anatomical wastes).

For animal/anatomical wastes/dressings (yellow category) :
Deep burial can be done or sent to an incinerator.
Criteria for deep burial :

- CBWTF is not available within 75 kms.
- Water table below 6–7 meters below ground level.
- At least 2 meters deep.
- At least 10 cms of soil should be put.



Immunization wastes :

- Disinfect using 0.5–1% hypochlorite solution for 15–20 hours and put into sharp pit.
- Sharp pit should be 1 m x 1 m x 1 m in size and should be brick lined/cemented. If not brick lined, metal container to be used.
- They are buried and covered.
- A sign board is also placed.

Biomedical waste handlers should be vaccinated to Hepatitis B and tetanus and should wear minimum 6 elements of personal protective equipment : mask/face shield, eye cover/ goggles, head cover/cap, gloves, boots/shoe cover, apron/ gown.

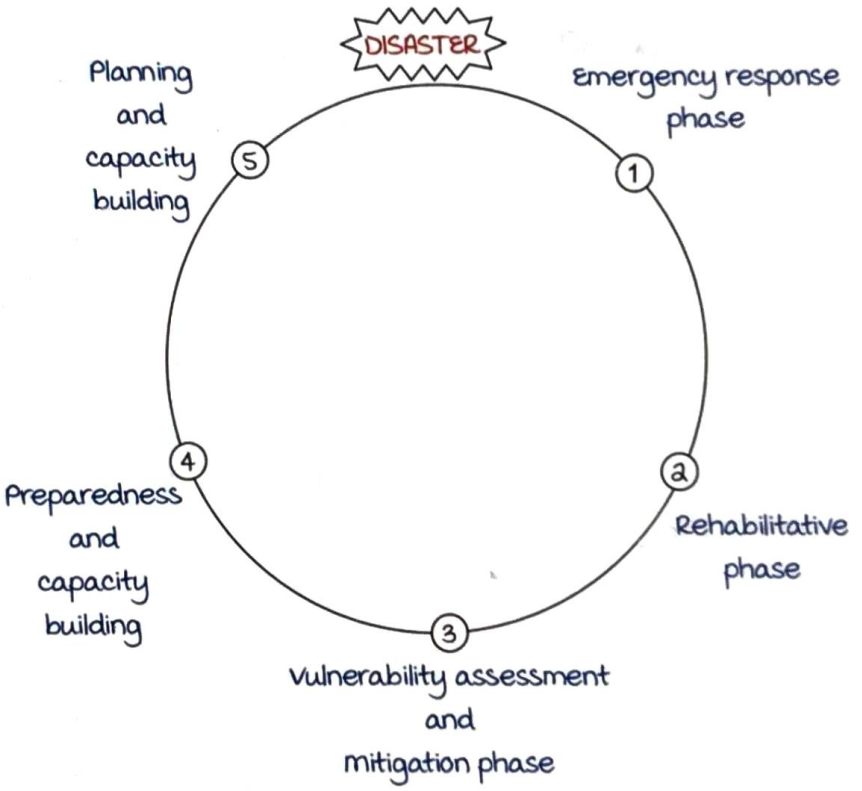
DISASTER MANAGEMENT

60c6b3eeaa8ded0e4e7e5ea7

- National disaster management day : 2nd Wednesday of October.
- Disaster : Occurrence of any unwanted event, which causes damage, ecological disruption, economic and loss of life or health and requires outside help / assistance / response.
- Hazard : The potential to cause damage or disruption of life or property.
- Disaster risk (DR) = Hazard x Vulnerability

Disaster cycle

00:02:00



Emergency respone

00:05:20

(i) Primary phase (ii) Secondary phase (iii) Tertiary phase

1. Primary phase (0-6 hrs) : First aid, triage, treatment.

(a) Triage : "Prioritization" (Based on colour tag)

Red : Immediate medical attention.

Active space

Yellow: Medical attention.

Green: Can wait for healthcare facility.

Black : Dead person.

(b) Reverse triage : used in scurge (bed scarcity), wars etc

Green → Yellow → Red.

2. Secondary phase (6–24 hrs)

Prevention of communicable disease by improving sanitation (↓ Death toll).

Tertiary phase

00:10:30

- > 24 hrs, "Help and Aid".
- By providing food, shelter, blanket etc.
- Chlorination : 0.7 to 0.9 ppm.
- Chlorine tablet : 2.5 gm for 225 litres of water.
- Safe water supply – tap water : 200 to 250 population at 15 litres / person / day.
- Vector control.
- Sanitation.
- Shelter.
- Measles vaccination campaign : Since measles outbreak and acute ~~bloody diarrhea~~ are more common in case of flood, earthquake etc.
- Vaccines for health-care professionals : Hepatitis B and TT vaccines.

During a disaster :

MC disease : Acute G.E.

MC outbreak : Measles .

MC vitamin deficiency : Vitamin A, PEM.

- Shelter :

  Area > 300 sq.ft.

  Area required : > 40 sq.ft / person .

  1 water point for > 250 people within 150 meters of living area.

  1 latrine for 20 people within 30 meters.

  Minimum distance between water and latrine > 100 m.

Active space

Disaster mitigation and preparedness 00:19:10

Disaster mitigation:

measures to reduce the impact of disaster, by administrative and legislative interventions, before a disaster occurs. Example :

- Proper land use.
- Building codes.
- Conducting regular health check up.
- Fire safety norms.

Disaster preparedness

- Being prepared to face a disaster.
- measures taken to prepare, gather resources, build capacity to face a disaster and effectively cope with consequences.

Categorization of disaster 00:23:00

Levels of disaster:

- 4 levels : L_0 – No disaster
  L_1 – Manageable disaster : district level
  L_2 – Manageable disaster : state level
  L_3 – Manageable disaster : national level (NDRF)

Earthquake seismic zone :

Modified mercalli scale – mm scale

- 5 zones– Zone I and II : < mm VI scale
  Zone III : mm VII
  Zone IV : mm VIII
  Zone V : > mm IX
- Zone IV : Seen in Delhi, Himachal, SikKim, Haryana, Chandigarh.
- Zone V : Seen in Bihar, Himachal, North eastern states, Andaman and Nicobar.

Disaster management in India 00:25:22

- Disaster management in India is under Ministry of home affairs (MOHA).
- Disaster management
  Biological disaster : MOHA + MOHFW.
  Landslide : MOHA + ministry of mines.
  Floods : MOHA + ministry of water resources.
  Tsunami / cyclone : MOHA + ministry of Earth sciences.
- NDRF : National Disaster Response Force.

UN disaster risk reduction program 00:27:36

Sendai framework :

- Understand disaster risk.
- To improve disaster risk governance.
- To invest in disaster risk reduction.
- Enhance disaster preparedness.

60c6b3eeaa8ded0e4e7e5ea7

SOCIAL MEDICINE AND HEALTH

Social medicine : Introduction 00:00:41

- Society :
  A group of individuals living as a community.
  They share common goals, culture and organization.
- Social structure :

  Pattern of relationship between individuals.
- Community :
  People living together within a common geographical boundary.
  They share common interests.
- Behavioral sciences :
  Sociology : Study of human behaviour and society.
  Psychology : Study of human attitudes, thought and behaviour/response.
  Anthropology : Study of physical, cultural and social history of man.

Sociology 00:04:32

- Socialization :
  Process of acquiring a culture.
  Promotes interaction.
- Socialism :
  System of production and distribution based on social ownership.
  Political term.
- Social epidemiology :
  Social factors which lead to disease.
- Socialized medicine :
  Professional services in health is provided by the state.
  Political term.
- Social medicine :
  Study of social, political, cultural, environmental factors affecting diseases.

- Social pathology :
  Study of social factors leading to social disease/ disharmony.
  Eg : Factors leading to crime, beggary, poverty, unemployment, human trafficking, child abuse etc.

Culture

00:09:27

- Culture :
  Acquired, learned way of doing things.
- Acculturation :
  Mixing of 2 cultures.
  Can happen due to : Trade.
  War/conquest.
  Industrialization.
  Religious organization (propaganda).
  Education.
- Customs :
  Established pattern for a society.
  Inherited.
  Folkways : Right way of doing things.
  Mores : Stringent rules (prohibitory).
- Traditions :
  Customs handed over from person to person.
- Taboo :
  Prohibitions related to human action.

Attitude

00:14:55

- Attitude :
  Expression of likes/dislikes.
  Usually permanent.
  Is based on : Prior experiences (learned).
  Knowledge (cognitive).
  Emotions (affect).
  It is not affected by motivation.

- Belief :
  Derived from close relations.
  Permanent, stable.
- Opinion :
  Based on current evidence.
  Temporary.
- Habits :
  Established way of doing things.
  Influenced by motivation.
- Learning :
  Continuous.
  Permanent change in behavior.
  Based on prior experience, cognition or affect.
  Can be conscious or sub conscious.
  Types : Cognitive : Based on knowledge.
  Affective : Based on emotions, attitudes.
  Psycho-motor : Learning a skill.

Social definitions

00:22:18

- Social mobility :
  Transitions across socio-economic statuses of the society.
- Social stress :
  Usually seen in transitional society.
  Uncertainty for younger population (↑ diseases).
- Social security :
  Sense of security by society for risk management.
  Eg : Unemployment, disability, severe diseases etc.
  Social security in India :
  Workmen's Compensation Act, 1923.
  Central Maternity Benefit Act, 1961.
  Employees State Insurance Act, 1948.
  Family pension scheme, 1971.
  Social security for civil servants (central and state government).
  It includes pension, gratuity, provident fund and family pension schemes.

Social security for general public comprises of Insurance Scheme (LIC, PPF).

- Social defence :

  Preventive, therapeutic and rehabilitative services to promote a healthy and wholesome growth of society. To oppose beggary, delinquency, trafficking etc.

Theories in sociology 00:28:49

Human needs :

Biological : Food, water, shelter, clothes.
Social : Love, affection, education.
Economic : Money.
Ego-centric (ego-integrated) : Power, self-respect.

- Marxist theory :

  If profit is valued more than health, ↑ chance to contact a disease.
  Economic cause of disease.

- Parsonian theory :

  Social stress (to meet demands of social roles) causes disease.

- Foucauldian theory :

  Associates disease to power and political influences 'Diseases are labels to segregate population'.

60c6b3eeaa8ded0e4e7e5ea7

- Feminist theory :

  Disease is caused by social role enforced on women by patriarchal men.

Group dynamics 00:36:33

Temporary groups :

- Crowd : Common interest, no leader.
- Mob : Emotionally charged, with a leader. Promotes violence.
- Herd : Blind followers, with a leader.

Permanent groups :

- Band : Small number of families living together.

- Village : Collection of families (> 20) with own houses.
  Agriculture as main source.
  Strong culture.
- Town/cities : Urban area.
  Dense population.
  Divided into strata.

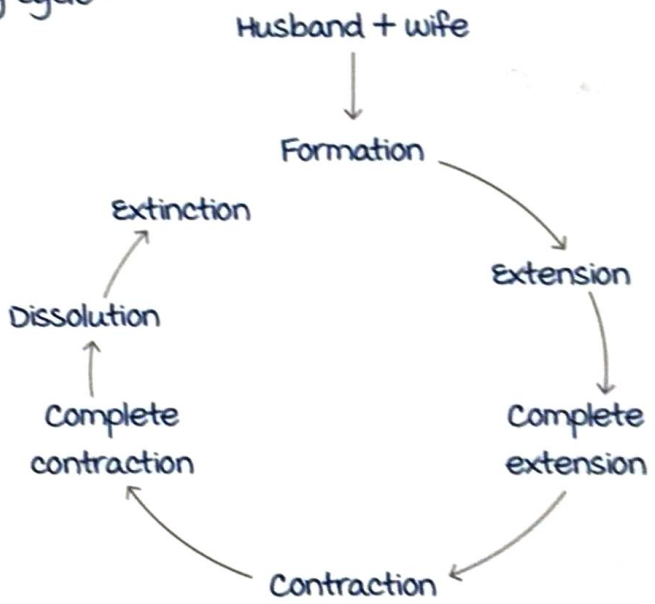
Family cycle

00:40:56

Family :

- Group of biologically related individuals who share a common kitchen.
- most powerful example of social cohesion.

Family cycle :



Family types :

- Nuclear : Father, mother and children.
- New family : A family less than 10 years old.
- Three generation family : Where grandparents, parents and children are living.
- Joint family : Where grandparents, parents, children are living with uncle, aunt and their families.
- Broken family : Both parents are not together.
- Problem family : A family which lags behind socially.

Health economics 00:45:40

- Gross National Product (GNP) : Total home income + abroad income.
- Gross Domestic Product : Home income (domestic).
- Net National product : GNP – expense (capital consumed).
- Purchasing Power Parity :
  Bag filling phenomenon (How much of a bag can be filled with same amount of money in 2 different countries).
  Good indicator : Tells about development of a country
- Poverty line :
  Divides people into above poverty line (APL) and below poverty line (BPL).
  Concept was introduced in India by
  → Tendulkar committee
  → Rangarajan committee
  In India (2018) :
  - A person is considered BPL if the person can't afford :
    Calories : 2100 Kcal (urban) or 2400 Kcal (rural).
    Money : 32/day (rural) or 47/day INR (urban).

Socio-economic indices / social stratification 00:50:37

- Urban :

1. Kuppuswamy scale :
   measured in 3 categories 1) Income : 1–12.
   2) Education : 1–7.
   3) Occupation : 1–10.
   Value range from 3 to 29.

Table 1: Occupation of the head of the family

S.No.	Occupation of the head	Score
1	Legislators, Senior officials & Managers	10
2	Professionals	9
3	Technicians and Associate professionals	8
4	Clerks	7
5	Skilled workers and shop & market sales workers	6
6	Skilled agricultural & Fishery workers	5
7	Craft & Related trade workers	4
8	Plant & Machine operators and assemblers	3
9	Elementary occupation	2
10	Unemployed	1

Table 2: Education of the head of the family		
S. No.	Education of the head	Score
1	Profession or Honours	7
2	Graduate	6
3	Intermediate or diploma	5
4	High school certificate	4
5	Middle school certificate	3
6	Primary school certificate	2
7	Illiterate	1

Active space

60c6b3eeaa8ded0e4e7e5ea7

Table 3: Total monthly income of the family	
Updated monthly family income in Rupees (2019)	Score
≥78,063	12
39,033 – 78,062	10
29,200 – 39,032	6
19,516 – 29,199	4
11,708 – 19,515	3
3,908 – 11,707	2
≤3,907	1

Table 4: Kuppuswamy's socio-economic status scale 2019

S. No.	Score	Socioeconomic class
1	26–29	Upper (I)
2	16–25	Upper middle (II)
3	11–15	Lower middle (III)
4	5–10	Upper Lower (IV)
5	< 5	Lower (V)

2. Shrivastava scale.

- Rural :

1. Uday Pareekh scale parameters :

1) Caste.
2) Occupation.
3) Education.
4) Land.
5) Social participation.
6) House.
7) Farm power.
8) material possessions.
9) Family members.

60c6b3eeaa8ded0e4e7e5ea7

-

Grade	Category	Score
I	Upper class	>43
II	Upper middle class	33 – 42
III	Middle class	24 –32
IV	Lower middle class	13 – 13
V	Lower class	<13

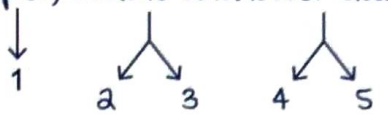
Active space

2. Radhokar scale.

3. BG Prasad scale.

   Based only on income.

   Divides into upper, middle and lower classes.



Revision of the Prasad's social classification for the year 2019	
Social class	Revised for 2019 (in Rs./ month)
I	7008 and above
II	3504–7007
III	2102–3503
IV	1051–2101
V	1050 and below

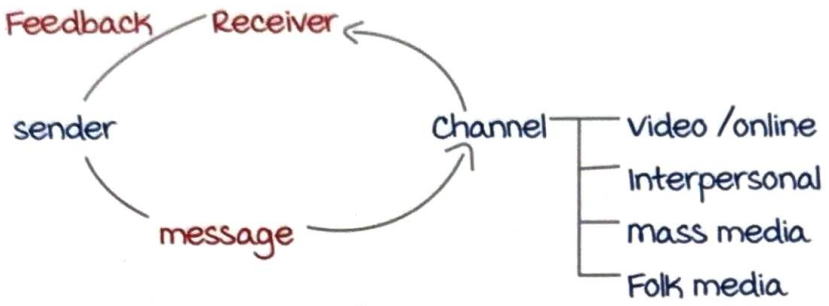
Wealth index :

- Based on income.
- Based on quintiles (1/20th of the population).

HEALTH COMMUNICATION AND EDUCATION

Communication process

00:01:07



Types of communication :

1. One way : Didactic communication (dictator type).
   Two way : Socratic communication.
2. Formal : Guidelined/structured way to talk.
   Non formal : Gossip circle/grape vine talk.
3. Verbal/visual/audiovisual.

Barriers of communication :

- Physiological : Hearing, expressing, representational problems.
- Psychological : Poor level of intelligence, emotional disturbance.
- Environmental : Noise, poor visibility.
- Cultural : Beliefs, understanding, language, customs, concepts.

Functions of communication :

- Information : Giving data/facts.
  Education : To increase knowledge → Change in attitude → Behavioural change.
- Motivation : Power to act from within.
  Persuasion : Influence.

Education	Propaganda
Knowledge. Actively acquired.	Instilled knowledge. Passively acquired.

Promotes thinking. Disciplines primitive thinking. Judge before you act. Self control & self motivation. Behavioural change present.	Halts thinking. Promotes primitive thinking. Gives emotional charge. Spoon fed with passive knowledge. No behavioural change.

motivation provides enlightenment which maybe short term.
motivation is given to people by educating them.

Persuasion is via influence, leads to conscious change in behaviour in a desired manner.
There is change in one's feelings, attitude, belief, usually for a short while (brainwash). Persuasion is delivered by propaganda.

60c6b3eeaa8ded0e4e7e5ea7

Approach to health education

00:16:48

- Regulatory approach :
  Legal action/government power used.

Eg : Mandatory sterilization launched in 1976 → stopped.
Child marriage act.
Banned the sati system.

- Service Approach : Free services are provided. However there are many issues with this approach.

Eg : Toilets.
Immunization.
Mid day meal scheme.

- Health education approach :
  Banners, posters etc.
  Cause propaganda.

Eg : Start teaching early (in young age).
Onus of health is on the individual himself.
Propaganda, mass media cause slow behavioural change.

Active space

- Primary health care approach :
  Community involvement.
  Intersectoral co-ordination.
  Active involvement of population.

Eg : • Rashtriya Kishor Swasthya Karyakram : Saathi approach.
• PHC/CHC : Yogi Kalyana Samiti, Mahila Arogya Samiti.

Modes of health education 00:23:12

Medical model : Information on treatment, early diagnosis, screening etc are given.

Motivation model : Make people aware of information/facts. This may result in motivation & action; leading to internalization.

Social intervention model : Most of the things we do are authenticated/approved/legitimated by others.
Nothing will change till the group changes.

Incentives :

Intrinsic : Patient is benefited.
Extrinsic : Financial – Janani Suraksha Yojana.
Psychological – Awards.
Material – TB poshana yojana.

Methods of communication 00:30:23

- Individual approach :
  Interpersonal contact, eg. telephone, letter, visits, interview.

- Group approach :
  4–6 members a group (not > 25 members)
  Group discussion : 6–12 members
  Panel discussion : Between experts, on a common topic.
  No structure/order.
  In front of an audience.
  Symposia : Lectures set in series in front of an audience.

In symposia, there is no discussion between the experts.
Work shop : Hands on training in order to attain skills.
Series of meeting, group size < 25.
Seminars : 6-8 hours/day, on a specific topic/theme.
CME/Conferences : On a topic/theme. Maybe privately or publicly funded. Enhances knowledge of attenders.
Role play : One of the best way of group discussion.
Gives a practical understanding + interaction.
Socio-drama enactment and at the end of the role play it is open for discussion.

- Mass approach :
  TV, radio, news paper.
  Online/social media.
  Direct mailing.
  Posters, museum exhibition, folk methods.

Delphi : Type of group discussion to solve a complex problem.
The problem and the solutions are shared with other groups.
Outcome of delphi is an acceptable and practically implementable solution for all sectors of the society.

Cafeteria : used for family planning.
Client chooses the mode of contraception suitable for them.

Type of interviewing

00:40:25

Structured : Predetermined structure.
Unstructured : Extempore questions and answers.
Focused : Used to study social & psychological effects of mass communication.
It studies experience, attitude, emotional response to specific intervention.
Repetitive : To note gradual change in people over time.
Social, psychological or behavioural changes.

Art of interviewing :

Contact → Start interview → Building rapport (most crucial) → Recall → Encourage → Guide → Recording (least done) → Close interview → Report writing.

GATHER : Greet Ask Tell Help Educate Review.

↓

most crucial

60c6b3eeaa8ded0e4e7e5ea7

HEALTH PLANNING & MANAGEMENT

60c6b3eeaa8ded0e4e7e5ea7

Committees in health care

00:00:33

1946 : Bhore committee.
1962 : Mudaliar committee.
1963 : Chadha committee.
1965 : Mukherjee committee.
1967 : Jungalwalla committee.
1973 : Kartar Singh committee.
1975 : Shrivastava committee
1986 : Bajaj committee
2002 : National health policy (5 year plans)

Bhore committee :

Chairman : Sir Joseph Bhore.

Primary recommendations :

a) Integration of preventive and curative services.
b) Development of PHC for 40,000 population.
c) Long term plan : 3 Million plan → 75-bedded hospital for 10,000 -20,000 population.
d) 3 month rural posting during internship.

Mudaliar committee :

- Chairman : Dr. A.L. Mudaliar.
- Health survey and planning committee.
- Proposed to launch All India Health Services.
- Based on Indian Administrative Services.

Chadha committee :

- Launched in 1963.
- Linked malaria worker and family planning worker and renamed them as Basic Health Workers for 10,000 population.

Active space

Mukherjee Committee (1965) :

Proposed delinking of malaria and family planning workers.

Jungalwalla committee :

- Dr. Jungalwalla → Director, National Institute of Health and Family Welfare.
- Recommendations for manpower issues in healthcare :
  a) Unified cadre.
  b) Recognition of extra qualifications.
  c) Equal pay for equal work.
  d) Special pay for special work.
  e) No private practice by government doctors.

Kartar Singh Committee :

Recommendations :

- Auxiliary nurse midwife (ANM) was renamed as multi purpose worker (female).
- Basic health worker (BHW) was renamed as multi purpose worker (male).
- Lady health visitor (LHV) was renamed to Health supervisor.

PHC for every 50,000 population..

Shrivastava committee :

Also called 'group on medical education'

Recommendations :

a) ROME scheme : Reorientation of medical education.
b) Referral services complex.

Bajaj committee :

Recommendations :

a) National Medical and Health Education Policy.
b) National Manpower Policy.
c) Establishment of health universities and Educational Commission for health services.

Objective /Target /Goal

00:15:10

Goal :

- Long term.
- Ultimate desired end point.

Target :

- Quantifiable.
- Achievable.
- Mid term milestones.

Objective : Short term end points.

Impact indicator of a programme is usually the target / objective.

Health planning

00:18:22

Planning cycle :

1. Analysis of health situation.
2. Establishment of objectives and goals.
3. Assessment of resources.
4. Fixing priorities.
5. Write-up of formulated plan.
6. Programming and implementation.
7. Monitoring.
8. Evaluation.

After evaluation of programme, analysis of health situation is repeated and the cycle continues.

Functions for effective planning :

P : Planning.
O : Organisation.
S : Staffing.
D : Direction.
Co : Co-ordination.
R : Review.
B : Budget.

Behavioural sciences 00:21:50

Human resource management techniques :

1. Organisational design : Hierarchy
2. Personal management :
   - Motivation
   - Intellectual capacity → Right people at the right job.
3. Communication :
   - Adequate communication between workers and higher authorities.
4. Information systems :
   - Reporting systems.
5. Management by objectives :
   - Incentives provided to workers for achieving targets.

Quantitative methods : 00:25:12

Network analysis :

- Method to implement the planned activity by arrow and dot diagrams.
- Analyse the constituents, resources available, and how to go about implementing the activity.
- Sequence of events can be understood by 2 techniques.
  a) Programme evaluation and review techniques (PERT) : Uses arrow diagrams to know which event to be conducted and the order.
  b) Critical path method (CPM) : It is the longest path to achieve the objective.
  Helps to understand the shortest time required to complete the programme.

Cost benefit analysis :

- Analyses the monetary benefit of a programme
  i.e, money spent and money earned from the programme.

Cost effective analysis : 60c6b3eeaa8ded0e4e7e5ea7

- Analyses the money spent and health benefits achieved (lives saved or disability avoided).

Active space

Work sampling :

- Systematic observation and recording of activities of a worker.
- Random assessment and documentation of work done → provides information about manpower needs, job performance and satisfaction.

Zero budget technique :

Budget analysis

Incremental budget	Zero budget technique
• Analysis of budget required in excess of previously existing budget.	• Analyse programme from initial level and come up with a budget. Benefit : Innovative and more open to changes.

Evaluation techniques

00:36:30

- To evaluate a programme, following methods can be taken up :
  - a) Monitoring : Ongoing evaluation.
  - b) Surveillance : Ongoing evaluation with support and scrutiny.
  - c) Impact assessment : Whether targets of the programme are achieved.
  - d) Incremental cost effectiveness ratio (ICER)

$$ICER = \frac{\text{Cost of product A} - \text{Cost of product B}}{\text{Effectiveness of A} - \text{Effectiveness of B}}$$

Effectiveness is measured in terms of input-output.

Efficiency : Input-output analysis under ideal /lab conditions.

Effectivity : Input-output analysis under practical or real conditions.

Inventory control /procurement 00:40:30

1. FIFO :
   - First-In First-Out method.
   - Based on expiry of drugs. Drugs that were procured first must be dispensed first.

2. GIGO :
   - Principle for waste management.
   - Garbage In - Garbage Out method.

3. ABC analysis :

For Eg : A : Low cost drugs.
B : Medium cost
C : Expensive drugs.

4. VED analysis :

V : Vital drugs
E : Essential drugs
D : Desirable drugs.

Matrix of ABC and VED analysis can be used to analyse procurement personnel.

	V	E	D
A	Low cost vital drugs		
B			
C			Expensive desirable drugs

A-V or low cost vital drugs can be procured by anybody.
C-D or expensive/desirable drugs can be procured only with permission of higher authorities.

Six sigma :
- Certification launched by motorola.
- Provides information about number of human errors in an event. (i.e 10^{-6} errors in one event)
- High level of certification of quality of an organisation.

Evaluation indicators of health services 00:45:00

1. Relevancy
2. Adequacy
3. Accessibility
4. Acceptability

} Basic criteria (most essential)

5. Effectivity : Programme should be practically implementable.
6. Efficiency : Input-output should show a positive response
7. Impact : Target /objective should be achieved.

Operations research 00:46:05

Research of the systems, organisation and functioning of a programme.

Research on the operations of a programme.

60c6b3eeaa8ded0e4e7e5ea7

Active space

INTERNATIONAL HEALTH

International health agencies :

- WHO
- UNICEF
- FAO
- Ford foundation
- ILO
- UNDP
- World bank
- USAID
- Red cross
- Rockefeller

WHO

00:01:11

- World Health Organisation

  1902 : Pan American Sanitary Bureau (1st organisation).

  ↓

  1923 : Health organisation of League of Nations.

  ↓

  1948 : Formation of WHO.

  (7th April)

World Health Organization

- Headquarters : Geneva , Switzerland
- Function :
  1) Prevention and control of disease.
  2) Family health.
  3) Research and statistical analysis of data.
  4) Biomedical research.
  5) Environmental health.

- Organisation :

Secretariat → Managerial function.

Executive body → 34 members. → 1/3rd members renewed every year.

World health Assembly → Final approval of the projects under WHO.

Active space

Regional offices of WHO → Head office

1. South East Asia → New Delhi
2. Africa → Congo
3. America → Washington. D. C.
4. Europe → Copenhagen (Denmark)
5. East Mediterranean → Alexandria (Egypt)
6. Western Pacific → Manila (Philippines)

United Nations International Children Emergency Fund [UNICEF]

00:07:13

- Formulated in 1946.
- Headquarters : New York (US).
- Functions :
  - mother and child health
  - nutrition , immunization and education.
- Initiatives :
  - BFHI : Baby friendly hospital initiative
  - GOBIFFF :
    - Growth monitoring.
    - ORS.
    - Breast feeding.
    - Immunization.
    - Family planning.
    - Food to the mother.
    - Female literacy.

Food and Agricultural Organisation (FAO)

00:09:38

- Headquarters : Rome.
- Formulated in 1945.
- Responsible for quantity and quality of food production , consumption including fisheries , farming.
- Improve condition of farmers in the rural area.

Active space

International Labour Organisation (ILO) 00:10:54

- Headquarters : Geneva , Switzerland.
- Formulated in 1919.
- Functions :
  - Increase social justice.
  - Economical and social stability.

United Nations Development Program (UNDP) 00:11:38

- Office : New York , US.
- Formulated in 1966.
- Concerned with efficient utilisation of manpower, human and natural resources.

UNFPA → United Nation Fund for Population Activities.

↓

For family planning and maternal and child health services (MCH).

The world Bank :

- UN agency promoting peace (peace grants)
- Improves the living standards of population .

USAID 00:13:43

- United states Agency for International Development.
- Helps in controlling communicable disease :
  - Malaria program.
  - TB nutrition program.
- Helps to improve the water supply and sanitation.

Active space

Red cross

00:14:36

- Formulated by Henry Dunant , 1864.
- Provide first aid (disaster, war)
  In India → Bangalore , Karnataka.

The Rockefeller foundation

00:15:47

- Philanthropic foundation.
- Established the All India Institute of Hygiene and Public Health (AIIPH), Kolkata (west Bengal).
- Headquarters : New York , US
- Works for upliftment of rural areas.

↓

Employment , power,
climate and H_2O conservation
health and disease.

Ford foundation

00:17:36

- For rural health in India.
- Formulated the National Institute of Health Administration and Education, Delhi.
- Helped with water supply and sanitation in West Bengal.

Bill and Melinda Gates foundation

00:18:20

- Philanthropic foundation.
- Works for diseases like TB , HIV.
- Promotes JE vaccination.
- GAVI : The Global Alliance for vaccine and Immunisation, comes under this foundation.

Active space

SIDA : Swedish International Development cooperation. Agency
Funds the RNTCP.

Danida :

- Danish International Development Cooperation
- Initiated the National programme for Control of Blindness (NPCB) in India.
- Helps in the control of leprosy and RNTCP.

Care foundation :

- Started in North America , 1945
- Office : Atlanta , Georgia , US.
- Works for MCH , women health , Adolescent health , child health , prevention of anaemia .

Themes of WHO health day :
2022 : Our planet, Our Health.
2021 : Building a fairer, healthier world.
2020 : Support nurses & midwives.
2019 : 'Health for all'
Universal health coverage by everyone and everywhere.

Bioterrorism Agents

00:22:00

Category A	First highest priority	↑ mortality ↑ morbidity Very fast spread.	↑ Public health impact,requires special action from agencies
Category B	Second highest priority	↑ morbidity mortality < A	Enhanced efforts by agencies
Category C	Third highest priority	↑ ↑ mortality ~ morbidity. Low spread, not an issue currently.	Engineered microorganisms : Maybe used for mass destruction in future

Active space

Category A has the highest spread, has the potential to cause pandemics.

Category A :

- Anthrax : Bacillus anthracis.
- Botulism : Clostridium botulinum toxin.
- Plague : Yersinia pestis.
- Small pox : Variola major.
- Tularemia : Francisella tularensis.
- Viral hemorrhagic fevers : Ebola , hassa , Machupo.

Category B :

- Brucellosis.
- Clostridium perferinges (Epsilon toxin).
- Food safety threats by salmonella, E.coli 0157:H7, shigella.
- Glanders (buckholderia mallei).
- Melioidosis.
- Psitaccosis (chlamydia psittaci).
- Q fever (Coxiella burnetti).
- Ricin toxin from ricinus communis (castor bean).
- Staphylococcal enterotoxin B
- Typhus fever (Rickettsia prowazekii).
- Viral encephalitis (WEE,EEE, VEE).
- Water safety threats (cholera, cryptosporidium parvum).

Category C :

Emerging infectious diseases → Nipah virus (Kerala 2017) and Hanta Virus.

Notifiable diseases under International Health Regulations :

Cholera.	Relapsing fever.	Influenza.
Plague.	Rabies.	SARS.
Yellow fever.	Salmonellosis.	Malaria.
Small pox.	Polio.	Louse borne typhus fever.

Active space

Among these, the diseases which have pandemic threat are : Cholera, Yellow fever, Plague, Influenza and Poliomyelitis. (mnemonic : CYPIP)

International travel regulations 00:30:18

For pregnant woman,
In domestic airlines → Travelling is allowed up to 32 weeks.

In cruise → < 24 - 28 weeks.

In order to travel to Yellow fever endemic countries.
↓
Yellow fever card is required.
↓
Yellow fever vaccine is taken.
↓
17 - D (live vaccine).
↓
Can be given during pregnancy if required.

Validity of vaccine : After 10 days of vaccination, for lifetime.

AAI (Aedes Aegypti Index) 00:33:16

No. of Aedes aegypti found within 400 m^3 of a particular area.
This is important as Aedes aegypti is a transmitter of yellow fever.
It should be < 1 for all international seaports and airports.

HISTORY AND EVOLUTION OF MEDICINE

Indian medicine

00:00:21

Timeline : 400 – 600 BC.

Ayurveda : Derived from Atharva veda.

3 humors (body fluids) in Ayurveda

Vata	Pitta	Kapha
(Wind)	(bile)	(mucus)

Atreya : 1st Indian physician & a teacher of medicine.

Sushruta : Father of Indian surgery ; Plastic surgery
Author of Sushruta Samhita.

Charaka : Father of Indian medicine ;
Author of Charaka Samhita.

Vagbhata : Classical Ayurveda writer.

The laws of Manu are based on personal hygiene.

Unani tibb :

- medieval age.
- Promoted & compiled by Arabs.
- Derived from Greek medicine > Roman medicine.
- Promoted in India.

Rhazes /Abu Bakr :

- Known for his contribution in pharmacology, pediatrics.
- Other contribution include the works on pupillary reactions and mercury purgatives.

Avicenna /Ibn Sina :

- Known for his contributions in pharmacology.
- Author of The canon of medicine.

Chinese medicine 00:08:23

- Based on the Yin - Yang principle, which is the male (yin) and female (yang) aspects of medicine.
- Discovered the art of acupuncture & acupressure.
- Includes hydrotherapy, massage therapy, dietetics & nutrition.

Egyptian medicine 00:09:54

Compiled & recorded in papyrus (plant used for writing material) based on the combined concept of God, doctor & priest.

Imhotep : 1st Egyptian physician

Edwin Smith Papyrus : Surgery in head and neck region.

Ebers papyrus : Prescription & drugs.

Horus : God of Egyptian medicine

Mesopotamian medicine 00:12:00

Known as the cradle of civilisation.

Used the concept of treating diseases under various specialties.

↓

Herb doctor ⟶ Physician

Knife doctor ⟶ Surgeon

Spell doctor ⟶ Psychiatrist

Studies on Geomancy & prescription writing established the Code of Hammurabi which includes the code of conduct for doctors towards the patient & the ethics.

Greek medicine 00:14:26

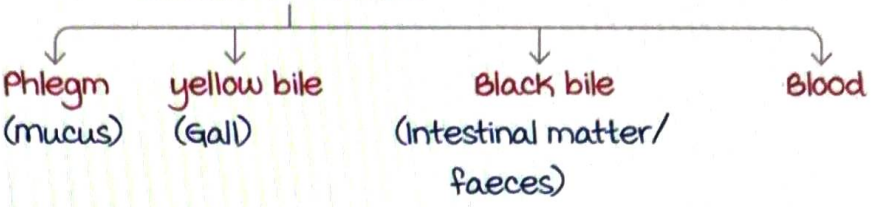
Aesculapius (God of medicine)

Daughters

Hygeia (Goddess of health)	Panacea (Goddess of medicine)
↓	↓
Preventive medicine	Curative medicine

Hippocrates :

Gave an organised understanding of medicine.
1st true epidemiologist.
Father of medicine.
Author of the book 'Air , water & places '.
Based on 4 humors.



These are the foundation of unani Tibb.

Roman medicine

00:18:18

Concept on health policy , sanitation , public health.
Galen : Medical dictator.
Known for his contributions in anatomy & physiology.

Modern medicine

00:19:45

Also known as scientific medicine.
Fracustorius : Founder of epidemiology - Theory of contagion.

Andreas vesalius :

- First man of modern medicine.
- Father of modern anatomy.
- Author of 1st book on scientific medicine → Fabrica.

Ambriose Pare : Father of modern surgery.

Edwin Chadwick:
Initiated sanitary awakening in 1832
(based on a cholera epidemic in UK).
Establishment of public health act in the UK in the year 1848.
UK : First country to have public health act.

Dr. John Snow : Father of Epidemiology.
Father of public health : cholera.
Cholera :

- Studied by Edwin Chadwick in 1832.
- Study by John snow in 1848.
- Study by William Budd in 1852-56 (Typhoid > cholera).

William budd discovered that fecal matter maybe causative in typhoid.

1st medical officer of health in the UK : John simon.

1st public health officer in the US : Lemuel shattuck.

60c6b3eeaa8ded0e4e7e5ea7

Fathers in medicine 00:25:50

Father of modern medicine : Hippocrates
Father of bacteriology : Louis pasteur
Father of immunology : Edward jenner
Father of Indian medicine : Charaka
Father of Indian surgery : Sushruta
Father of Modern Anatomy : Andreas vaselius

1st antibiotic was discovered by Alexander Fleming
↓
Penicillin

Growth charts : made by David morley using weight for age.
Blood groups identified by Karl Landsteiner.

Countries pioneering in public health 00:28:16

Compulsory sickness insurance : Germany
Family programme : India
Blindness control : India
Health care system & public health : UK
Socialised medicine : Russia

Important scientists & their contributions 00:30:05

Louis Pasteur : Germ theory of disease.
work on vaccine.
Pattenhoffer : multifactorial causation of disease.
mc mahon : web of causation.
James Lind : Scurvy / vitamin c.

Active space

Robert Koch – Studied TB bacilli, Anthrax.
Identified cholera.
Koch's postulates.

60c6b3eeaa8ded0e4e7e5ea7

Bruce – African sleeping sickness.
Identified Tsetse fly as the cause.
Edward jenner – Work on vaccination (small pox).
Walter reed – Yellow fever & its vector (Aedes).
Ronald Ross – Life cycle of malarial parasite.

PREVENTIVE GERIATRICS

Preventive geriatrics refer to prevention of sickness/ morbidities associated with old age.

Problems of old age

00:01:08

m/c morbidity	Others	Psychological
Cataract, glaucoma.	Cardiovascular	mental changes.
Neural deafness	disorders.	Sexual changes.
(40–50 dB).	BPH.	Emotional changes.
Failure of special	Detrusor instability.	
senses.	Cancer	
Locomotary	Accidents/falls.	
disability.		
Empysema.		

60c6b3eeaa8ded0e4e7e5ea7

m/c group of morbidity : Disability.
m/c organ dysfunction : Cardiovascular Disorders (including HTN & DM)

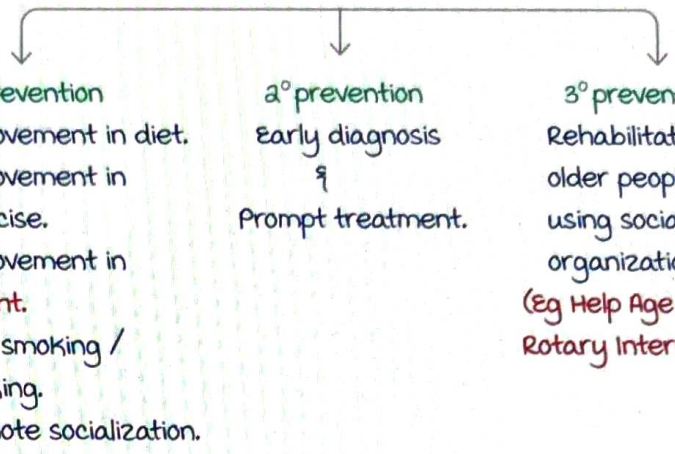
1999 : National Policy For Older Persons (NPOP)
To open : Old Age homes.
Day care centres.
Vocational courses to learn new skills.
Rehabilitation centres : Physiotherapy.

Vayoshri Yojana : more number of old age homes under public-private partnership

Active space

Strategies of NPOP

00:06:56



Weight reduction is the most important factor for changing the quality of life.

60c6b3eeaa8ded0e4e7e5ea7

Active space

GENETICS AND HEALTH

Tjio & Levan : Described chromosome number as 46 in humans.

Har Gobind Khorana : Worked on codes of nucleic acid and also developed of synthetic genes & nucleic acids.

Watson /Crick /Wilkins : Double helical structure of DNA.

In normal human body 30,000 genes present.

Genetic disorders

00:02:53

These can be of three types :

Chromosomal abnormalities :

Autosomes : Down's syndrome.

Sex chromosomes : Klinefelter syndrome(XXY), super male (XYY), super female (XXX), Turner's syndrome.

Unifactorial abnormalities : Include Mendelian diseases.

1) Autosomal dominant : Marfans, retinoblastoma, AD Polycystic Kidney Disease (ADPKD) , ABO blood group disorders.

2) Autosomal Recessive (AR) : Inborn errors of metabolism.

3) X linked dominant (XD) : X - linked vit D resistant rickets.

4) X linked recessive (XR) : Hemophilia, G6PD, color blindness.

Multifactorial abnormalities : There is genetic predisposition to developing cancers, diabetes, coronary artery disease, IHD, mental retardation, peptic ulcers etc.

Mendel's law

00:07:00

Law of unit characters :

" All characters are units by themselves & certain factors (genes) control the expression of these charaters during the development of organism. "

Law of dominance : " All the genes occur in pairs & one gene will be dominant and other gene is recessive. "

Law of segregation : " When germs cells are formed, only one of the allele is randomly passed to offspring. "

Hardy Weinberg law

00:08:54

This is for population statistics.

" Frequency of an allele in the population will remain same, until there are external factors. "

External factors :

- Mutation (Antigenic shift /drift).
- Migration (Selective).
- Natural selection.
- Non random mating (Assortive).

Founder effects :

This is responsible for " difference in the distribution of disease in population "

It is due to difference in expression of the genes in founding population.

Genetics & preventive health

00:13:23

- Health promotion.
- Specific protection.
- Early diagnosis & treatment.

Health promotion :

- Eugenics.
- Euthenics.
- Genetic counselling.
- Genetic preventive measures.

Eugenics : Promote the health & wellness of human race.

Positive Eugenics : Individuals with good genes reproduce more, so that these genes are maintained.

Negative eugenics : To reduce the frequency of a bad gene. By means of genetic counselling.

Euthenics : Environmental manipulation – To provide optimum environment for the genes to express freely.

Dysgenics : Due to changes in environment, deterioration of expression of the gene occurs leading to decrease in growth of population.
Dysgenics is opposite to euthenics.

Genetic counselling : Counselling of individuals to manipulate with their genes.

These are of 2 types :

(i) Prospective genetic counselling :
People who are at risk are counselled. Usually done before marriage, so that the defective gene is not propagated to the off spring. Useful in thalassemia, sickle cell disease.

(ii) Retrospective genetic counselling :
Parents visit the counsellor, as the previous child is already suffering from certain disease. It is done so to find out the probability of propagation of the disease to the next offspring.

Genetic preventive measures :

- Reduce consanguineous marriages ; as it increases chances of albinism, alkaptonuria, phenylketonuria.
- Not promote late marriages; more chances of Down's syndrome and other chromosomal aberrations.

Specific protection :

- In pregnancy : Avoid X-ray.
- In pregnancy – not to expose themselves to mutagens like harmful insecticides, pesticide, alcohol, smoking, chemicals like lithium.
- Giving anti-D globulin to prevent risk of Rh incompatibility.

Early diagnosis & treatment :

Check pregnant female for any chromosomal abnormality & subject them to any preventive / treatment measures.

- Fetoscopy.
- USG.
- maternal serum alpha-fetoprotein (MSAFP) testing.
- hCG assay.
- Amniocentesis.

These are modes of early diagnosis for genetic defects during pregnancy.

Indications	methods
Advanced maternal age, previous history of chromosomal aberration, IUGR	Cytogenetics (Amniocentesis, CVS) Chorionic villus sampling
Biochemical disorders	DNA diagnosis, protein assay
Congenital anomaly	Sonography, fetoscopy
NTD screening, trisomy	MSAFP, hCG assay.

Prevention stage	Conditions	Strategy
Rh icompatibility	Postpartum anti D globulin	Primary prevention
Congenital rubella	Adolescent girl immunization	
Congenital malformations	Folic acid supplements, control of maternal DM, ANC counselling	ANC screening, primary prevention & secondary prevention
	GDM screening & early control, high risk maternal screening, carrier screening for hemoglobinopathies	
Congenital malformations	Congenital malformation screen of newborn, physical examination	Neonatal screening, early detection and treatment : Secondary prevention
Congenital hypothyroidism, PKU, congenital hyperbilirubinemia, IEM	Biochemical screening of newborn	

If mother is diabetic : Controlling sugar is primary prevention for the baby .

In a healthy pregnant female, GDM screening is done, this is primary prevention for the baby .

New born screening for congenital malformation is 2° prevention .

Advances in molecular genetics 00:32:03

- DNA technology : Newer DNA probe techniques, FISH (fluorescent insitu hybridization), RT – PCR (Real time – PCR)
- Gene therapy : Introduction of new genes.
- Human genome project : Mapping of human gene.
- Human genome diversity project : It is mapping of genes to understand human evolution.
  It is collection of genetic samples from all the indigenous population.
  It is used to understand founder effect; health & diseases of the community .

GRAPH international :
(Genome based research and population health)
It is to integrate the genetic development & understanding into public health & policies .

Genetic epidemiology 00:37:26

To find genetic causes for genetic diseases.
This includes :

- Familial aggregation studies to determine if there is any genetic component.
- Segregation studies to understand pattern of inheritance (pedigree analysis).
- Association studies to study alleles in the genomes & pattern of expression & association.

Followed by DNA sequencing, cloning, genetic engineering to make genetic diseases curable.
Molecular epidemiology is done to assess molecular risk factors leading to disease.
Example : Role of selenium & molybdenum in MI.

Active space