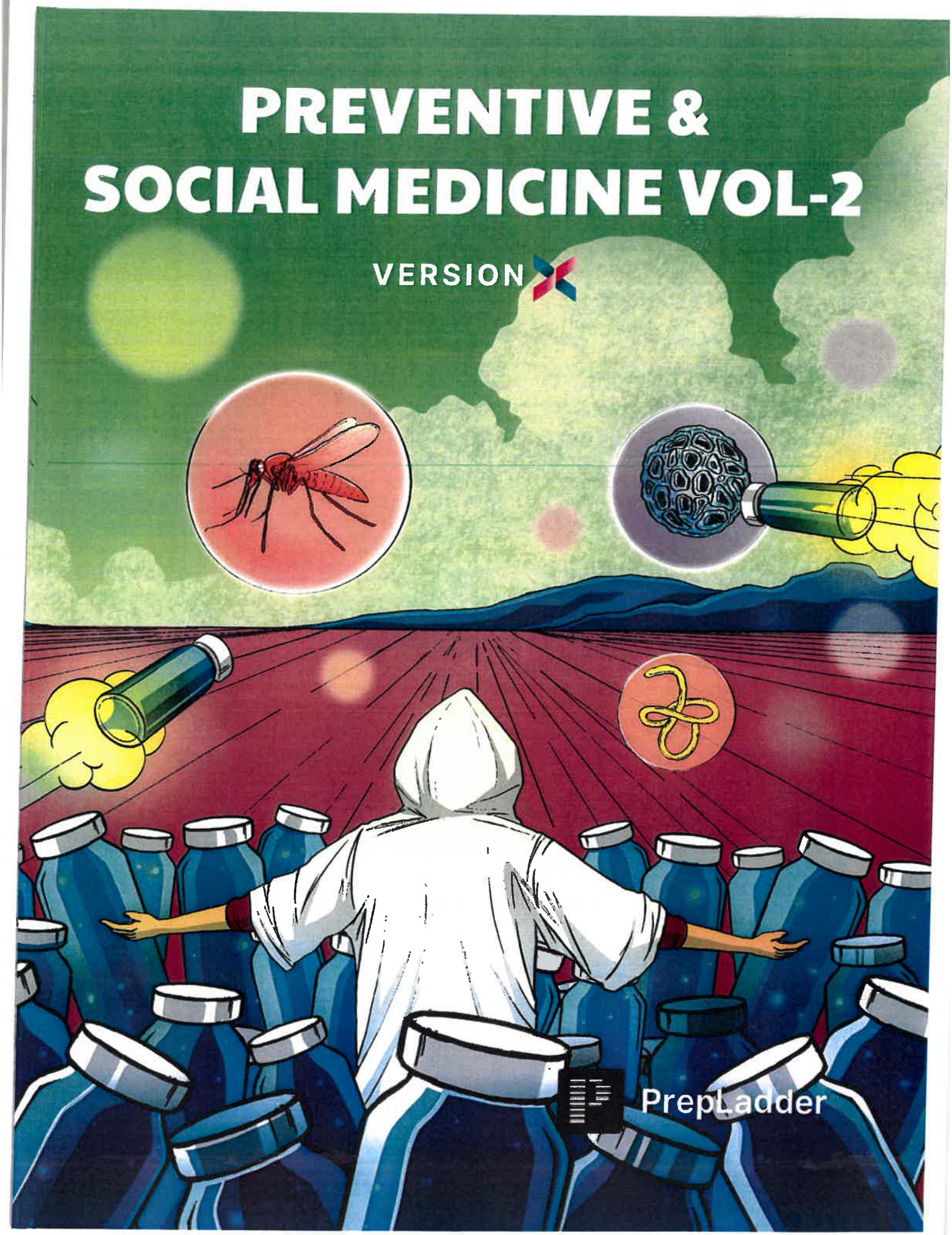
PREVENTIVE & SOCIAL MEDICINE VOL-2

VERSION X



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Structured Notes According to PSM

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PSM Vol-2

1. INFECTIOUS DISEASE EPIDEMIOLOGY

DEFINITIONS

00:00:05

- A clinically manifest disease of man or animal resulting from an infection → Infectious disease
- An illness due to a specific infectious agent or its toxic products capable of being directly or indirectly transmitted from man to man, animal to animal, or environment to man or animal → Communicable disease
- A disease transmitted through contact → Contagious disease

Important Information

- All Infectious diseases are communicable : Not necessarily, e.g., Tetanus
- All communicable diseases are infectious : Yes

OTHER DEFINITIONS

- Presence of a vector on the body/clothes → Infestation
  Presence of an infective agent/vector on any surface or inanimate thing → Contamination
- Infections that occur in immunodeficiency/immunosuppressed → Opportunistic infection
- New infections arising 48 hours after hospital admission → Nosocomial infection
  - M/c organism: Staphylococcus aureus
  - M/c mode of transmission: Unclean hands
  - M/c infection:
- Physician/health facility induced → Iatrogenic infection
  - Due to medical negligence
  - Due to adverse reactions
  - Due to any procedure

AGENT DETERMINANTS

00:04:41

Ability of an agent to invade a host & develop within a host	Infectivity = Infected/ total population
Ability of an agent to induce local immune response	Antigenicity
Ability of an agent to invade, multiply, and develop within the host, causing abnormal functioning, signs, and symptoms of disease	Pathogenicity = Diseased/ infected
Ability of an agent to invade and multiply in a host, causing severe disease, death, and fatality	Virulence = Killed/ diseased

RESERVOIR Vs SOURCE

DEFINITIONS

- Any person, animal, object, or substance from which an infectious agent passes or is disseminated to the host → Source of infection
- Any person, animal, arthropod, plant, soil, or substance in which an infectious agent lives and multiplies on which it primarily depends for survival and where it reproduces itself in such a manner that it can be transmitted to a susceptible host → Reservoir

Important Information

- Reservoir and source are same in tetanus (soil)
- Reservoir and source are different in Hookworm infection

RESERVOIRS AND SOURCES

DISEASE	RESERVOIR	SOURCE
Tuberculosis	Man	Sputum
HIV/ AIDS	Man	Body secretions, fluids
Malaria	Man/ mosquito	Infected blood
Rabies	Dog/ other animals	Saliva
Measles	Man	Droplets
JE	Pig and birds	Infected mosquitoes
Cholera	Man	Unsafe water and food
Typhoid	Man (Case or carrier)	Unsafe water and food
Plague	Rodents	Infected flies
Hookworm	Man	Soil contaminated with infective larvae
Tetanus	Soil	Soil

HOST DETERMINANTS

00:11:05

TYPES OF HOST

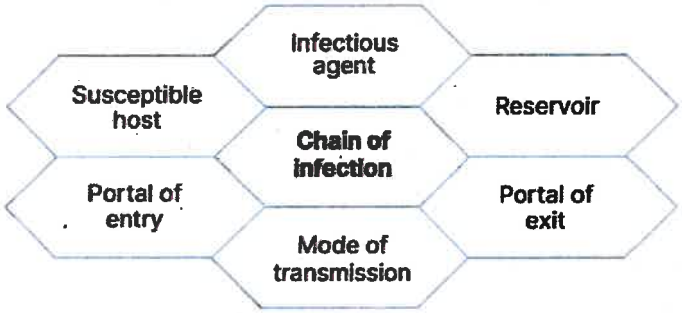
1. Primary Host (Definitive host): Sexual cycle of agent occurs
   - E.g., Mosquito → [redacted]
2. Secondary Host: Asexual cycle of agent occurs.
   - E.g., Man is the secondary host in malaria
3. Dead-end host/ accidental host/ incidental host: No man-to-man transmission occurs
   - E.g., Rabies, Tetanus, JE, & Plague (not pneumonic plague)
4. Obligate host: Man is the only host for agent, Man to man transmission occurs.
   - E.g., Typhoid, Measles

DISEASE	PRIMARY HOST	SECONDARY HOST
Malaria	Mosquito	Man
Filaria	Man	Mosquito (culex)

Tapeworm	Man	• Pig (T.Solium) • Cattle (T.Saginata)
Guinea worm	Man	Cyclops
Sleeping sickness	Man	TseTse fly
Hydatid disease	Dog	Sheep, cattle, man

CHAIN OF INFECTION (BREAKING CHAIN OF TRANSMISSION)

00:14:55



- Agent> Reservoir (Portal of exit)> Modes of transmission > Host (Portal of entry)

CHAIN OF TRANSMISSION	METHOD OF BREAKING THE CHAIN
Infectious agent	Disinfection, sterilization, anti-microbial technique
Source and reservoir	Environmental control → Source reduction (engineering technique), safe water supply & sanitation
Portal of exit	Waste disposal, PPE
Modes of transmission	Hand hygiene, environmental sanitation, disinfection, sterilization
Portal of entry	PPE, hand hygiene, wound care
Susceptible host	Immunisation, nutrition

MODE OF TRANSMISSION

00:19:02

DIRECT TRANSMISSION	INDIRECT TRANSMISSION
Direct contact → Direct touch, scabies	Vehicle Borne
Droplet infection	Vector- borne • Mechanical • Biological
Contact with soil → Tetanus	Air- borne • Droplet nuclei • Dust
Inoculation into skin or mucosa → Needle prick injury, dog bite	Fomite- borne
Transplacental (Vertical)	Unclean hands and fingers

DIRECT MODE OF TRANSMISSION

DROPLET (DIRECT MODE OF TRANSMISSION)	DROPLET NUCLEI (INDIRECT MODE OF TRANSMISSION) - (Air borne)
• Size of particle > 5 Micron • Heavier particle • Falls to ground and travels a distance < 1 meter	• Size of particle < 5 Micron • Lighter particle- Remain suspended in air • Travel distance > 1 meter. Eg, measles, chicken pox, influenza, TB, COVID

- Trans placental / Vertical transmission
  - 1st trimester: Chicken pox, rubella
  - 2nd trimester: Parvovirus
  - 3rd trimester: Toxoplasmosis, syphilis, CMV, Hepatitis B
  - During delivery: HIV, Herpes, Hepatitis C

INDIRECT MODE OF TRANSMISSION

VECTOR BORNE

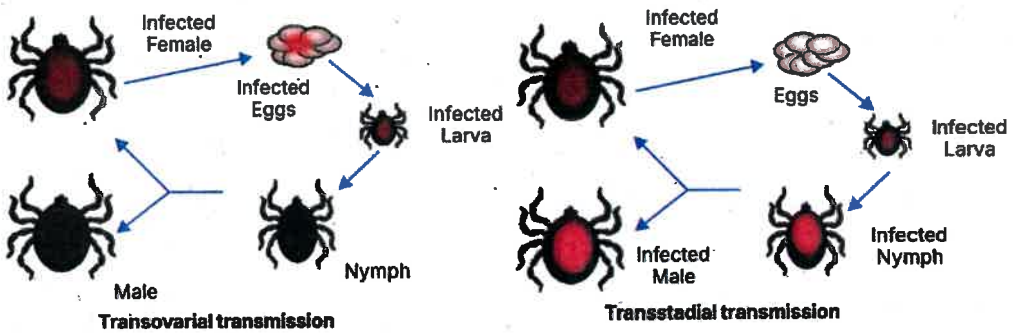
- An arthropod that physically carries the agent to the host. Here, the agent does not multiply and develop in the vector :
  - Eg: housefly
- Arthropods in which an infectious agent undergoes a necessary cycle of development in the vector: Biological vector
  - Eg: Anopheles (Malaria)

TYPES OF BIOLOGICAL TRANSMISSION

1. Propagative: Change in number (multiplication) of agent in vector
   - E.g. Plague
2. Cyclo-developmental: Change in shape, form or stage of microorganism after entering the vector
   - E.g. Microfilariae in culex
3. Cyclo-propagative: Cyclical and propagative change. Change in shape and number
   - E.g., Plasmodium in anopheles

TRANS OVARIAN (VERTICAL TRANSMISSION)

- Pathogen is passed from one generation of an insect to the next generation
- Infectious agent- Vertical transmission from infected parent to her progeny (infected offspring)
  - Infected tick → Egg → Infected larvae
- E.g. KFD, Scrub typhus, Indian tick typhus, Q fever, RMSF



TRANSSTADIAL TRANSMISSION : (HORIZONTAL TRANSMISSION)

- Pathogen is passed from one stage of an insect to the next stage
- Transstadial transmission occurs when a pathogen remains with the vector from one life stage to the next
- For example, the bacteria Borrelia burgdorferi, the causative agent for Lyme disease, infects the tick vector as a larva, and the infection is maintained when it molts to a nymph and later develops as an adult

IMPORTANT DEFINITIONS

00:28:04

- Disease with signs and symptoms → Clinical case
- Disease at suboptimal level: No signs and symptoms (can transmit) → Subclinical case
- Infectious agent in dormant stage i.e, no signs and symptoms (do not transmit) → Latent case
- An infected person or animal that harbors a specific infectious agent in the absence of discernible clinical disease and serves as a potential source of infection for others → Carrier
- Not in dormant stage, transmits infection → Carrier
- Transmission can occur via clinical case, subclinical case, and carrier

TYPES OF CASES

- Primary case: First case introduced in population
- Secondary case: [redacted]
- Index case: First case to come to the notice of an investigator or epidemiologist
- Serial interval: Time interval between primary and secondary case

TIMING & DURATION

- Incubation period (IP): The time interval between entry of organism and appearance of first sign and symptoms
- Latent period: Similar to IP → Term for NCDs
- Window Period: The time interval between the entry of organism and coming lab positive (detecting markers in blood)
- Median Incubation period: The time taken for 50% of individuals to develop disease following exposure to an infectious agent
- Generation period: The time interval between entry of organism and maximum infectivity
- Isolation Vs Quarantine: Isolation is done for cases, and quarantines are done for healthy contacts

CARRIER (TYPES)

- Epidemiologically, they are more dangerous than cases
- Contact carrier: Develop from a case
- Paradoxical carrier: Develop from another carrier
- Incubatory carrier: Shed organisms during incubation.
- Convalescent carrier: Shed organisms during recovery
- Chronic carrier: Transmits > 3 months
- Healthy carrier: Develop from subclinical cases
- Pseudo carrier: Carriers of avirulent organism
- Healthy carrier
  - Emerge from subclinical cases.
  - They are victims of subclinical infection who have developed carrier state without suffering from overt disease but are nevertheless shedding the disease agent
  - E.g., polio, cholera, meningococcal meningitis, salmonellosis, diphtheria

CHRONIC	HEALTHY	CONVALESCENT	INCUBATORY
Malaria	Polio	Diphtheria	Diphtheria
Meningitis	Typhoid	Typhoid	Measles
Typhoid	Cholera	Cholera	Mumps
Dysentery	Diphtheria	Dysentery	Polio
Gonorrhea	Meningitis	Pertussis	Pertussis
HBV			HBV
			Influenza
			COVID 19

MEASUREMENT OF DISEASE EVENTS

00:37:13

IMPORTANT CALCULATIONS

Q. In a community of 10,000 individuals, 1000 deaths are reported. Out of 1000 deaths, 50 deaths occur due to disease X. The Total number of cases due to disease X is 100. Calculate: Crude death rate, Proportional Mortality Rate (X) & Case Fatality Rate (X)

Ans.

- Crude death rate= Total number of deaths/ Midyear population x 1000
  - 1000/10000 X 1000 = 100/1000MYP
- Proportional Mortality Rate (X)= Deaths due to disease/ Total deaths X 100
  - 50/1000 X 100 = 50/1000X 100= 5%
- Case Fatality Rate (X) = Deaths due to X/ total cases (X) X 100
  - 50/100 X 100 = 50%

CRUDE DEATH RATE	• (Total number of deaths/ Midyear population) x 1000
PROPORTIONAL MORTALITY RATE	• (Deaths due to disease / Total deaths) X 100 • It is the
CASE FATALITY RATE	• Virulence/severity of disease • (Deaths due to disease / Total cases of disease) X 100 • Independent of duration of a disease • Important for acute infection
ATTACK RATE	• (Total number of cases in an area/ Total susceptible population) X 100 • Calculated during an Outbreak
SECONDARY ATTACK RATE	• Measure of communicability/ transmissibility of a disease • SAR=(Total number of secondary cases that develop following exposure to a primary case within one IP off disease/ Total susceptible) X 100

BASIC REPRODUCTION NUMBER	• Number of absolute new cases arising from a single case • Independent of IP • Basic Reproduction Number → R_0
EFFECTIVE REPRODUCTION NUMBER	• Number of new cases arising from a single case with adjustment for density, immunity, and susceptible population • Effective Reproduction Number → R_E or R • If R_E o R_E= 1 (Endemic) o R_E>1 (Epidemic) o R_E<1 (Disease will die out)

Q. In a community of 100 children, 60% are vaccinated for measles. On Jan 10th, 5 children developed measles. Following exposure to these children, 10 more children developed measles within the next week. Calculate SAR of measles

Ans.

- Given:
  - Safe: 60
  - Susceptible: 100-60=40
  - Primary case: 5
  - Secondary case: 10
- SAR= [10/ (40-5)]X 100 = (10/35) X 100 = 28.5%

HERD IMMUNITY

00:52:35

- Phenomenon by which non-immunised population is protected from a disease by virtue of immunised population
- Important in measles, polio.
- Tetanus does not show herd immunity
- R_E<1
- HE= 1- (1 / R_E)

PPE

00:54:51

DONNING	DOFFING : Disinfect at every step
Gloves	Shoe cover
Apron+ shoe cover	Outer pair of gloves
Mask	Face shield/ goggle
Headcover	Apron
Face shield	Inner glove
Gloves	Remove mask- with a fresh pair of gloves.

HAND WASHING

- Handwashing should be done for 15- 20 secs

BASIC DEFINITIONS

00:57:38

- **ZOONOSES:** Diseases arising due to/related to animals
  - Eg: Rabies, Leptospirosis

BASED ON ORIGIN OR SOURCE -3 TYPES:

- Zooanthroponosis: Humans to animals. Eg: Cattle TB
- Anthropozoonosis: Animals to human. Eg: Rabies, JE
- Amphixenosis: Animals to humans and vice versa. (Bidirectional)
  - Eg: Staphylococcal infections

BASED ON TRANSMISSION:

- Direct zoonoses: Directly from bite (1 animal) Eg; Rabies
- Cyclozoonoses: 2 or more animals involved. (vertebrates) Eg: Taeniasis, Hydatidosis
- Meta-zoonotic: 2 or more animal (vertebrates or non-vertebrate host)
  - Eg: KFD, Tick-borne encephalitis
- Saprozoonosis: Animal or non-animal sources. E.g: Mycosis, Histoplasmosis

BASED ON SPREAD

- Epizootic: Epidemic in animals. E.g: Plague
- Enzootic: Endemic levels in animals. E.g: Staphylococcal infections
- Epornitic: Diseases originating among birds having epidemic levels. E.g: Psittacosis

DISEASE CONTROL

01:01:33

- SIR MODEL
  - Susceptibility
  - Infectivity
  - Recovery
- Birth is susceptible to death
  - Susceptible to disease →
  - After infection, the person can recover or die → Infectivity rate (beta)
    → Recovery rate (gamma) - Depends on the pathogenicity of organism
    → Death rate (delta)
  - To control disease: Decrease infectivity or increase recovery

METHODS TO CONTROL INFECTION

- Non-spatial method: Infectivity rate by
  - Vaccination → Primary level of prevention
  - Early diagnosis and treatment → [redacted]
- Spatial method
  - Isolation and quarantine

ISOLATION VS QUARANTINE

ISOLATION	QUARANTINE
• Done in diseased individuals • Till communicability or transmissibility of disease or till patient recovers • Primary level of prevention	• Done in healthy controls • Till maximum incubation period of disease → Absolute quarantine • Primary level of prevention

Important Information

- Modified quarantine: Partial limitation in movements
  - E.g: Segregation of children from school

INCUBATION PERIOD OF DISEASES

DISEASE	INCUBATION PERIOD
Influenza	18-72 hours
Measles	10-14 days
Chickenpox	14-16 days
Rubella	2 to 3 weeks, average 18 days
Mumps	2 to 4 weeks (14-18 days)
Diphtheria	2-6 days
Pertussis	7-14 days max unto 3 weeks
Bacillus cereus	1-6 hrs
Most upper respiratory diseases:	2-5 days
COVID 19	3-21 days
Influenza	18-72 hours
Staphylococcal	1-8 hrs
Clostridium perfringens	6-24 hours
Salmonella	12-24 hours

Botulinum	18-36 hours
Cholera	1-2 days (3 days-3 weeks)
Typhoid	10-14 days
Polio	7-14 days
Hepatitis A	15-50
Most diarrheal disease	1-5

PERIOD OF ISOLATION

01:09:16

CHICKENPOX	Until all lesions crusted, usually 6 days after onset of rash
MEASLES	7 days after onset of rash
GERMAN MEASLES	None except women in first trimester or sexually active nonimmune women in child-bearing years not using contraceptive measures should not be exposed.
INFLUENZA	3 days after onset
MUMPS	Until swelling subsides
PERTUSSIS	4 weeks or until paroxysms cease
DIPHTHERIA	Until 48 hrs of antibiotics or negative cultures after treatment
TUBERCULOSIS	Until 3 weeks of effective chemotherapy
CHOLERA	3 days after tetracycline started
SHIGELLOSIS AND SALMONELLOSIS	Until 3 negative stool cultures
HEPATITIS A	3 Weeks of onset
COVID	14 Days

PERIOD OF COMMUNICABILITY

01:10:36

CHICKEN POX	1-2 days before to 4-5 days after appearance of rash
MEASLES	4 days before to 5 days after rash appearance
RUBELLA	7 days before symptoms to 7 days after appearance of rash
MUMPS	4-6 days before symptoms to 7 days thereafter
INFLUENZA	1-2 days before to 1-2 days after onset of symptoms
DIPHTHERIA	14-28 days from disease onset
TUBERCULOSIS	As long as not treated

MCQ's

Q. Which of the following best characterizes a cyclodevelopmental transmission mechanism?
a. The agent remains unchanged in shape upon entering the vector.
b. The agent multiplies and develops in the vector, altering its shape.
c. The agent only increases in number within the vector.
d. The agent changes shape after entering the vector.

Ans. (d)

Q. What is the period of isolation for hepatitis A?
a. 3 weeks of onset
b. 14 days
c. Until 3 negative stool cultures
d. 3 days after tetracycline started
Ans. (a)

Q. COVID 19 epidemic resulted in enforcement of quarantine worldwide. Which of the following is false about quarantine?
a. Done for diseased contacts
b. Known as absolute quarantine
c. Done for maximum incubation period of the disease
d. Primary level of prevention

Ans. (a)

2. CHICKEN POX AND SMALL POX

CHICKENPOX

00:00:18

EPIDEMIOLOGY	CAUSATIVE AGENT	• Varicella zoster virus [human herpes virus – 3]
	INCUBATION PERIOD	• 14 – 16 days
	SOURCE OF INFECTION	• Case of chickenpox (person-to-person/ direct contact, oropharyngeal secretions)
	MODE OF TRANSMISSION	• Droplet & droplet nuclei o Droplet infection: Size of particle:>5micron falls → due to gravity & travels for a distance<1m o Droplet nuclei: Size of particle: <5micron → remains suspended in air & travels for a distance >1m • [redacted] leading to congenital varicella
	PERIOD OF COMMUNICABILITY	• 1-2 days before to 4-5 days after appearance of rash
	SECONDARY ATTACK RATE OF CHICKEN POX	• >80% → 85-90%
	M/c LATE COMPLICATION OF CHICKENPOX	• Shingles → reactivation of the virus in 10% cases due to fall in CMI.
	MOST RAPID AND SENSITIVE MEANS OF DIAGNOSIS	• Examination of vesicle fluid under microscope (shows round particles)
	CONGENITAL VARICELLA	• More life threatening if acquired in 1st trimester of pregnancy
	HOST FACTOR	• Age → up to 10 years
	ENVIRONMENTAL FACTORS	• M/c in winters and early spring

CLINICAL FEATURES

PRE-ERUPTIVE STAGE

- Mild to moderate fever
- Malaise
- Chills
- Body ache

ERUPTIVE STAGE

- 1st clinical sign: [redacted]
- Rash appears on erupts with 1st day of fever.
- Rash is symmetrical
- It is superficial and area of inflammation is seen around the rash
- Appears on trunk, face, and very few on the extremities
- Centripetal distribution: spreads from periphery to centre
- Axilla and mucosal surface are involved

- Palm and soles spared
- Clear fluid vesicle looks like a dew drop on rose petal appearance
- Pleomorphism: All stages occur simultaneously at the same time
- Unilocular
- With every new crop → eruption fever rises.
- Rapid evolution
  - Scabs (not infective) are formed within 4-7 days
- Patient is non-infectious once the lesions have crusted

Important Information

Smallpox rash

- Deep seated,
- No area of inflammation around the rash
- Centrifugal in distribution
- Palms and soles are affected, and axilla is spared

COMPLICATION WITH CHICKENPOX

- Varicella pneumonia: M/c complications in neonates, adults, pregnant woman and immunocompromised patients
- Reye's Syndrome: children with clinical chicken pox treated with aspirin
- Immunocompromised individuals can get life threatening complications

VARICELLA IN PREGNANCY

- Varicella in first 2 trimesters → Congenital varicella
  - More life threatening if acquired in 1st trimester
- Varicella at any stage of pregnancy especially in 3rd trimester → Maternal varicella pneumonia
- Varicella </=5 days antepartum to 2 days postpartum →

MATERNAL VARICELLA

- Maternal varicella during pregnancy may cause fetal wastage and birth defects such as
  - Cutaneous scars
  - Atrophied limbs
  - Microcephaly
  - Low birth weight
  - Cataract
  - Microphthalmia
  - Chorioretinitis
  - Deafness
  - Cerebrocortical atrophy

ALGORITHM FOR THE DIAGNOSIS AND MANAGEMENT OF VARICELLA IN PREGNANCY