

Infection

UTI

Commonest infection is urinary tract infection
UTI is defined as significant bacteriuria in the presence of
Symptoms.

Significant bacteriuria : Number of bacteria $> 10^5$ CFU/ml
colony forming units.

Epidemiology UTI More

in sexually active women.

Diabetics

Anatomical malformation of urinary tract

women More prone to UTI's than males because of

short urethra
closer to anus. } than in males

Etiology

Escherichia coli

Staphylococcus saprophyticus

less commonly : Proteus mirabilis
Klebsiella pneumoniae
Enterococcus species.

Symptoms : Burning sensation with Micturition (2)

Pain in midline suprapubic region

Frequency of micturition ↑

Hematuria (bloody urine)

Cloudy & foul smelling urine

High temperature

In children, UTI is very harmful as it causes permanent renal damage.
(Infants) →

Pathophysiology : Normally urinary tract is sterile.

E. coli that inhabit the perineal area ascend into bladder via urethra.

↓
Leading to cystitis (Infection of bladder).

Urine becomes good culture medium favourable for bacterial growth.

↓
If pH is 5.5 or less.

If lower of urinary tract infection fails to treat involves upper tract resembling pyelonephritis (kidneys).

③ High urine glucose content and defective host
Necrotic immune factors in DM leads to infection

In postmenopausal women \rightarrow bladder prolapse or urethral
Prolapse / Neurogenic bladder

Residual urine in the bladder \rightarrow Residual
(Incomplete bladder emptying) bacteria act on
bladder mucosa.

Diagnosis: H/o Dysuria & ↑ed frequency.
Urine samples \rightarrow tested for Leucocytes
Urine culture is confirmatory diagnosis.

Prevention ? Treatment: Oral antibiotics

- Trimethoprim
- Cephalosporins
- Ciprofloxacin
- Levofloxacin
- Co-trimoxazole

If Pyelonephritis: IV antibiotics

Recurrent UTI's: Scan kidneys
& bladder.

X-rays & contrast media to check anatomical
& treated accordingly.

Typhoid

The Typhoid fever is a septicemic infection

↓ Caused
by

Salmonella Typhi

- Usually through ingestion of contaminated food & water
- The illness is characterized by prolonged fever, headache, Nausea, loss of appetite, Diarrhoea
- It spreads among individuals by direct contact with feces of an infected person as the bacillus lives in the Intestines & blood stream of humans.

Symptoms

High fever as 103° to 104° F

Stomach pain

Headache.

Rash over skin

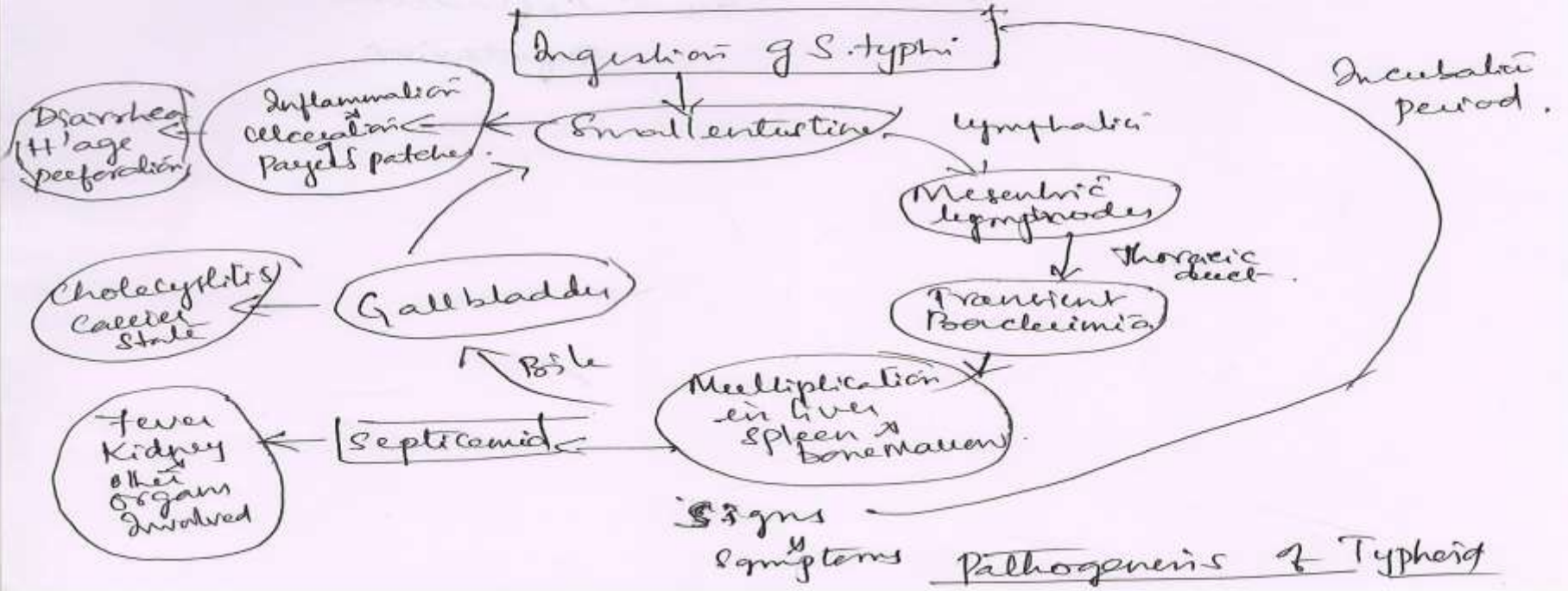
Pathogenesis

From After ingestion → S. typhi
1-3 wks in intestine

- Reaches blood stream, by WBC to liver spleen and bone marrow & replicates.
- Some resettle blood stream & other GI tract to shed in feces.
- If untreated intestinal bleeding & perforation

Kidney involvement.

leading to Death.



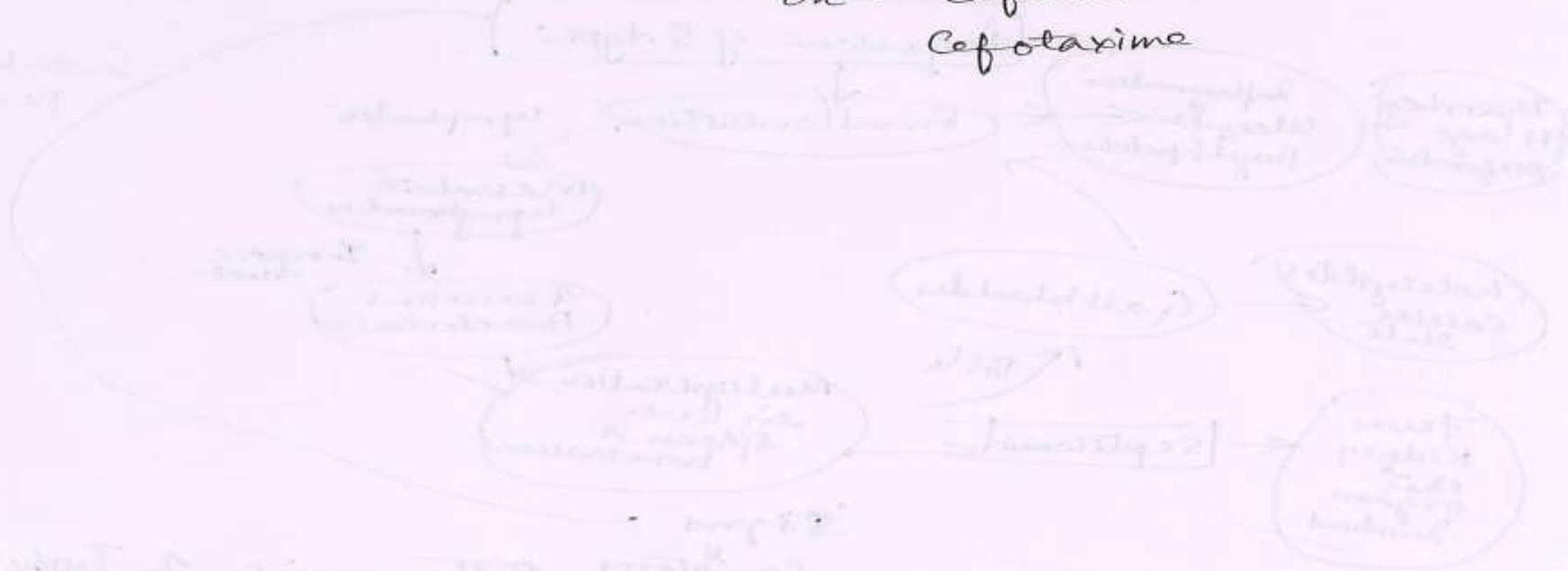
Treatment: ~~Fluoroquinolones~~ Fluoroquinolones (B)

Eg: Ciprofloxacin & Ofloxacin

are drug of choice for treatment of typhoid fever.

→ Recently azithromycin used but - Resistant strains have already identified

→ In Multi drug resistant strains → Injectable third generation Cephalosporins
Ex: Ceftriaxone
Cefotaxime



MENINGITIS

Inflammation of Meninges



which are

thin Membranes covering of brain and spinal cord.

Etiology

Infection

Due to

→ Viral

→ Bacterial

→ Fungal

Inflammatory response to certain types of chemotherapy or other chemical agents -

3 categories of bacterial agents are responsible for 80% Bact Meningitis
- H. Influenza type B
- Meningococcal meningitis - N. Meningitidis
- Pneumococcal → Streptococcus pneumoniae

In children → More frequently infected by grp. of bacterial like Haemophilus influenza, Neisseria Meningitidis & Streptococci pneumoniae

In Newborns : from Mother → G. B. streptococci, E. coli, Listeria Monocytogenes.

Adults : Either by S. pneumoniae / N. Meningitidis.

② Viral : Herpes Simplex virus, Mumps & Measles viruses, Varicella virus which later chicken pox, Theobalte - bite of infected mosquitoes

3) Pat's w/ AIDS more prone to get Meningitis from fungi

4) A Person having blood bone disease lead to meningitis when intral infection of lung, throat, tissues of heart ear not treated properly ->

↓
Organism will continue to multiply & find its way into the blood stream & pass the blood brain barrier.

4) Pat's who suffer skull fractures can have abnormal openings to the sinuses, Nasal passages & Middle ears &

Organisms in respiratory system won't cause any disease but pass through openings caused by such fractures - reach meninges causing infection.

5) Pat who undergo surgical procedures or who have had foreign bodies surgically placed within their skulls. (such as tubes to drain abnormal amounts of accumulated CSF)

↓
Have ↑ risk of meningitis.

Organisms can also reach Meninges via entoneural spread.

Spreads along a Nerve using as a ladder to reach skull & then Muclophy into Cerebral Meningitis

Symptoms

- Fever
- Head ache
- Vomiting
- Sensitivity to light → Photophobia
- Irritability
- Severe fatigue
- Stiff neck
- Reddish purple rash on skin

If not treated progresses to seizures, confusion & coma.

Pathogenesis

Bacterial Meningitis originate from the host obtaining from infectious agent from Neutrophils

H. Influenza type b. breakdown of epithelial cell tight junctions, sloughing of the

Ciliated cells :

cilia are critical in beating infectious agent upwards & away from respiratory tract.

Invasion of the epithelium by intercellular / Intra-cellular routes & passage of organisms to submucosa.

Pathogenesis of Meningitis } →

Nasopharyngeal colonization

↓
Local invasion

↓
Bacteremia

↓
Endothelial cell injury

↓
Meningeal invasion

↓
Subarachnoid space inflammation → Cerebral vasculitis

↓
Increased CSF outflow Resistance

↓
Hydrocephalus

↓
Interstitial Edema

↓
↑ ICP → ↑ Intracranial pressure

↓
Decreased cerebral blood flow

← Increased BBB Permeability

↓
Vasogenic Edema

↓
Cytotoxic Edema

↓
Cerebral infarction



Diagnosis :

LP : tried to diagnose
CSF is drawn & Examined

(5)

for the presence of bacteria / fungi

Normally CSF has certain fixed amount of glucose and protein.

Then % vary in bacterial, viral or other causes of meningitis

For Ex: Bact Meningitis - Lowers the percentage of glucose in CSF

as bacteria eat away the host's glucose for its nutrition.

~~NO~~ NO WBC seen in CSF. Normally

presence of WBC in CSF indicates meningitis

Treatment : Penicillin & cephalosporins are ~~not~~ useful to treat

Many antibiotics cannot cross BBB & are given directly. IV at very high doses.

Antiviral : Acyclovir : Helpful in shortening the course of viral meningitis

Antifungal : Medications are also available for treatment

To ↓ Inflammation → steroid preparation (6)

Pat's who develop seizures → require treatment to stop seizures & to prevent

Prevention: Treatment of other infections of ear / sinuses / Throat
Meningococcal vaccine Exiti → Recommended for individual travelling to high risk areas
Vaccine for H. Influenzae type B is now given as a part of standard Immunological program.

Treatment
Antibiotic: Acyclovir
Antifungal: Miconazole
Antiviral: Acyclovir
Antifungal: Miconazole

Tuberculosis

Tuberculosis known as TB

Caused by *Mycobacterium tuberculosis* bacilli

which affects

lungs - Pulmonary TB

CNS → meningitis

→ Tuberculosis is multisystem infectious disease.

Lymphatic system

→ About 10 million people were sick with tuberculosis in 2015 worldwide.

Circulatory system

→ About 1.8 million people died from tuberculosis worldwide in 2015 according to WHO.

Genitourinary

→ HIV associated TB infections are leading cause of death in HIV patients.

Bones & joints

Etiology:

Mycobacterium tuberculosis

Small rod like acid fast bacillus.

Can withstand weak disinfectants &

Can survive in dry state for weeks

Nontuberculous *Mycobacteria* → cause pulmonary disease resembling TB, lymphadenitis

② Skin disease → This include Mycobacterium avium, M. fortuitum

Transmission: TB is spread by aerosol droplets expelled by people with TB disease of lungs.

↓
When they cough sneeze or speak or spit

Each droplet is 5 micrometers in diameter contains 1 to 3 bacilli
Persons who are in close contact are at highest risk of becoming infected rate of 22%.

A person is not treated can infect another 20 people per year.

Pathophysiology:

When ~~reach~~ Mycobacterium tuberculosis bacilli

↓ Reach

Pulmonary alveoli

↓
Infecting alveolar macrophages.
Where they replicate

Primary site of infection in the lungs is called
"Ghon focus"

From there they are transported to distant tissues through blood stream

And organs pick up bacteria & TB develop in that ⁽³⁾
organs (Kidneys, brain & bone)

- Tuberculosis is one of granulomatous inflammatory condition
- T lymphocytes & B lymphocytes & fibroblasts aggregate and surrounds the infected Macrophages to form granuloma.

within granuloma.

↓
T lymphocytes (CD4+)

↓ secrete cytokine
Interferon gamma.

which activates Macrophages to destroy the bacteria fighting infection
(CD8+) also directly kill infected cells.

Bacteria are not eliminated with the granuloma & become dormant, resembling latent infection

If bacteria gain entry into blood stream from an area of damaged tissue spread throughout the body & sets up myriad foci of infection appearing as tiny white tubercles in the tissue called

Miliary tuberculosis which has a high fatality rate.

symptoms :

Productive cough for > 1-3 wks.	} when lungs are involved Pul Tuberculosis
Chest pain	
Hemoptysis	

Systemic symptoms }

- fever
- chills
- Night sweats
- Loss of Appetite
- Weight loss
- Easy fatigability

Only 10% of TB infection progresses to active tuberculosis - disease
 90% have latent infection & have NO symptoms.

Extra pulmonary sites :

- Pleura
- CNS
- Lymphatic system
- Genitourinary system
- Bones & joints

Diagnosis :

- Medical History
- Physical Examination
- Tuberculin skin test
- Serological test
- Chest X ray
- Microbiologic smears & cultures

- Treatment :
1. Identifying & treating all persons who have TB disease
 2. finding & evaluating the persons who are in contact with TB patients
 3. Testing high risk groups for TB infection for treatment of latent infection and to ensure the completion of treatment

BCG vaccine : BCG vaccine as a part of TB control Prog for infants (in many countries)

- > Efficacy of vaccine is about 80% against Tubercular Meningitis
- > Efficacy for pulmonary tuberculosis -> TB Prevention is variable from 0-80%

Drug therapy : Antibiotics used to kill the bacteria. (6)

Rifampicin & Isoniazid → commonly used.

Active TB disease → best treated with combinations of several antibiotics

Latent TB disease → single antibiotic

Primary resistance occurs in persons who are infected with a resistant strain of TB.

A patient with fully susceptible TB develops secondary resistance during TB therapy because of inadequate treatment.