

Lec 1

Urinary Tract defenses

- **Sterile**
- Bacteria can reach urinary tract but immune system responds properly w/out bad immune response
- innate defense:
 - 1) mechanical - **micturition** (flow of urine)
 - 2) Chemically - **low pH** of urine inhibit bacterial growth;
lactoferrin binds iron so bacteria can't use it;
IgA prevents attachment of bacteria to epithelium

Urinary Tract infection (UTI)

- Includes: Asymptomatic bacteriuria (ASB), Cystitis, prostatitis, pyelonephritis
- * higher incidence of UTI in **women** b/c of **short urethra**
- Upper UTI = kidney's & ureters
- lower UTI = bladder, prostate, urethra

Epidemiology

- 50-80% of **women** have at least 1 UTI in life
 - ↳ 20-30% have recurrent episode
 - ↳ if recurrence **w/in 2 weeks** = **relapse**
 - ↳ if after 2 weeks = **reinfection**
- can be symptomatic or asymptomatic, community acquired or health care associated
- UTI is the **most common health care associated infection** usually due to **Catheter** → endogenously or exogenous

- much higher prevalence in females : males in preschool, school, or reproductive ages due to anatomical differences

- prevalence equalizes at more extreme ages → neonate & geriatric

Clinically

- Uncomplicated UTI : in healthy people

- Complicated UTI : people w/ underlying disease, urinary obstruction or retention, immunosuppressed, pregnant

* presence of foreign body (catheter)

Etiology

- both complicated & uncomplicated most commonly due to E. coli that gains virulence factor & becomes uropathogenic e. coli (UPEC)

↳ gram (-) rod ; grey moist smooth colonies ; part of gut microbiota

- E. fecalis common in complicated UTI mainly hospital associated due to catheter *

↳ gram (+) cocci in pairs or short chains

- K. Pneumoniae normal GI flora, seen in hospital settings

* Pneumoniae & fecalis both resistant to many antibiotics & can transfer resistance to other species by horizontal gene transfer

- *Proteus mirabilis* produces urease → break down urea into ammonia → ↑ urine pH → form precipitate as urinary stones
- ↳ gram (-) rod, swarming* motility

Virulence factors

- fimbriae : adherence to epithelium
- flagella : propells bacteria into bladder
- toxins : Kill epithelial cells & WBC
- Siderophores : tries to take iron for growth
- capsules
- the bacteria are usually normal flora that gained virulence factors
- they move from urethra to bladder, & can form biofilms on catheters

Lec 2

How does UTI Present?

Cystitis & Pyelonephritis

- cystitis : dysuria frequency & urgency, nocturia, hesitancy, suprapubic pain, gross hematuria
 - Cystitis symptoms before pyelonephritis
 - ↳ infection goes to kidney
 - mild pyelonephritis : fever*, costovertebral angle tenderness
 - ↳ indicates kidney involvement
 - Severe pyelonephritis : high fever, nausea, flank / loin pain
- ↳ do murphys percussion test to check for pain

- pyelo: can also be caused by **Staph Aureus**
- pyelo: usually in pts. w/ immunosuppression

Diagnosis

- **detailed history** is important ... why?

b/c if pt shows up w/ classical symptoms (dysuria, frequency, back pain), 50% chance its UTI ... if you rule out STD's (no vaginal discharge) → 90% chance its UTI

- some STD's can mimick UTI so we do more tests ...

- **Dipstick test** checks for presence of **nitrite**
↳ enterobacteriaceae converts nitrate to nitrite

- dilution of urine may give false (-)

- **leukocyte esterase test**: indicate WBC's in urine

- *** urine culture is gold standard** → especially for

pregnant women

↳ to ↓ contamination of culture, do **midstream clean catch**

↳ colony count of **$>10^2$** for diagnosis of UTI

Treatment

- **Nitrofurantoin**, Trimethoprim, flouroquinolones

↳ can be given empirically but depends on **region to region**

∓ the common cause of UTI in that region

- treatment depends on site of infection ∓ complicating

Conditions

* majority of UTI is uncomplicated Cystitis
↳ simple infection

Complications of pyelonephritis

- renal scarring, emphysematous pyelonephritis, sepsis
- if pt is not responding to antibiotics, suspect perinephric abscess
- A congenital abnormality such as vesico ureteric reflux can cause chronic pyelonephritis
- Emphysematous pyelonephritis is confirmed by CT Scan, & shows presence of gas in perinephric spaces
↳ give antibiotics, drainage & nephrectomy
- Xanthogranulomatous pyelonephritis is rare inflammation of kidney parenchyma due to stone → leads to yellow tissue filled w/ lipid laden macrophages, necrosis & hemorrhage
↳ E coli, Pseudomonas, Proteus main causes

Prostatitis

- infection of prostate w/ symptoms similar to cystitis but w/ fever, perineal pain or pain w/ defecation, chills, but no flank pain
- infectious & noninfectious causes, mainly older men
- Chronic prostatitis in people w/ previous acute prostatitis or manipulation (catheter)

Lec 3

Asymptomatic Bacteriurea (ASB)

- diagnosed by 2 ways:

1) microbiological : a cut off count \rightarrow needs 2 urine samples w/ same bacterial strain $> 10^5$ colonies in women... in men, 1 sample $> 10^5$ colonies

2) Clinical : no referable symptoms of UTI

- E-Coli is most common, but has few virulence factors
- many adverse outcomes of ASB :

Pregnancy

- 1st category of people that should be screened for ASB
- should be screened at least once in early pregnancy
- \uparrow risk of developing pyelonephritis \rightarrow leads to premature delivery or low birthweight

Traumatic genitourinary procedures

- 2nd group of people to be screened
- transurethral resection of prostate = \uparrow rate of bacteremia
- Renal implants \uparrow risk as well

Catheter associated UTI (CAUTI)

- most common healthcare associated infection (30%)
- endogenous or exogenous
- Bacteria persists b/c of biofilm
- remove or replace catheter $\hat{=}$ treat w/ empirical antibiotics
- alternatives to chronic indwelling catheter is intermittent catheterization

now lets revise to be able to answer questions

how to think about it.

if one of these pts comes in w/ dysuria, frequency, urgency....

- healthy women w/ clear history → uncomplicated cystitis
→ no urine culture needed, just give antibiotics & follow up
- healthy women w/ unclear history → uncomplicated or STD → dipstick, culture, STD evaluation
- male w/ perineal or pelvic pain → prostatitis → urinalysis, culture, urology evaluation
- not healthy → complicated UTI → address modifiable or anatomic abnormalities (stones)

If one of these pt comes in w/ back pain, nausea, vomiting, fever, cystitis symptoms....

- healthy / not pregnant → uncomplicated pyelonephritis
→ urine culture
- not healthy / predisposing factors → pyelonephritis → blood & urine culture

If pt comes in w/ non localizing symptoms (fever, leukocytosis, altered mental status & no obvious non urinary cause

- Consider CAUTI or pyelonephritis → urine or blood culture → change catheter

If pt comes w/ (+) urine culture but no symptoms...

- Pregnant, renal transplant, invasive procedure. → ASB →

Screening & treatment or remove catheter

* Important note!! when doing culture, colonies of 10^2 offers more specificity & sensitivity, but we commonly diagnose based on 10^5 colonies

LEC 4

Sexually Transmitted diseases (STD)

- wide variety of pathogens transmitted usually by sexual intercourse
- presents usually w/ discharge, ulcers, pelvic pain, dysuria & dyspareunia ... but usually asymptomatic
- pt w/ STI should be tested for other STI

Risk factors

- many sexual partners, no barrier contraception, sexual orientation & practices
- low socioeconomic status, < 25 years of age, symptomatic partner
- prevalence & incidence vary by region & sexes
 - ↳ less prevalence in males, STI more common in Africa & Europe

* about 1 million new infections each day!

- low prevalence in Jordan

Bacterial vaginosis

- only in women & very common (11-48%)
- change in normal flora of vagina ... lactobacilli is changed

to new spp. (Bacteriodes & Mobiluncus)

- the new spp. **degrades peptides** → foul smelling discharge

Epidemiology

- due to multiple partner, douching, or even in women who never had vaginal intercourse

- Many asymptomatic

- white **fishy smelling** discharge, can cause preterm labor

- ↑ risk of getting other STD's

Diagnosis

- examine discharge based on AmseI criteria:

1) **clue cells** - coccobacilli adherent to epithelium

2) vaginal pH > 4.5

3) positive amine test using **KOH** shows **fishy smell**

Treatment

- 1/3 resolve spontaneously

- if not, give **metronidazole** or **clindamycin**

- recurrence is common (30%)

Trichomoniasis Vaginalis (TV) (protozoa)

- most common non bacterial STD

- works by:

1) damage to host epithelium

2) inflammation → activation of host immune response

3) disruption of microbiota b/c they compete for nutrients

Epidemiology

- Sexual transmission, usually asymptomatic in both sexes
- women: Smelly yellow discharge, itchy, abdominal pain, dysuria & dyspareunia, strawberry cervix
- men: urethritis → discharge, pain in urination & intercourse

Diagnosis

- asses discharge
- microscopy: big motile flagellated protozoans
- point of care test: high sensitivity & specificity
- Nucleic Acid Amplification Test (NAAT) → gold standard
↳ highest sensitivity

Treatment

- Metronidazole
- treat partner as well to prevent reinfection

Syphilis

- thin gram (-), very small, Spirochetes
- transferred in 2 ways:
 - 1) Congenitally: snuffles in babies
 - 2) Transfusion: through blood
- must be cultured on mammalian cells (not agar) b/c they depend on host cell ... culture not used often → too difficult
- extremely sensitive to oxygen

Clinically

- Primary phase: Chancres → very contagious → on genitals

or mouth

- ↳ heals on its own, but bacteria then goes into the blood
- 2nd phase: Systemic manifestations → skin lesions all over body, fever, headache, ocular manifestations
 - ↳ resolves after a few weeks & goes to latent stage & causes damage to tissue it resides in
- Late (Tertiary) phase: Severe organ damage → neurosyphilis, dementia, blindness
 - ↳ Gumma in organs, aneurysm

Diagnosis

- sample from chancre using dark field microscopy, immunofluorescent, or PCR, serology
- screening Ab tests: VDRL test or RPR
 - ↳ non specific
- Specific treponemal test: Partial agglutination test (TP-PA)
 - ↳ aggregation of blood particles = (+) test

Treatment

- controlled w/ safe sex practice & antibiotic treatment
- Penicillin