

Bacteriology #1

Urinary tract infections:

- Almost one third of cases admitted to medical centers are related to urinary tract infection
- Urinary tract infection and respiratory infection together encompass about fifty percent of cases presented in out-patient clinics
- Urinary tract infection is the second most common type of infections in the community (second only to RTI)
- Urinary tract infections covers a wide spectrum though which they can manifest, ranging from the totally benign and asymptomatic to symptomatic and fatal.
- The most important thing to keep in mind when dealing with urinary tract infection is that early detection of symptoms and rapid embarking on the appropriate treatment can readily contain the disease and spare the patient further complications
- UTI is more common in women than in men, this can be attributed to two reasons:
 - 1 - UT in females is more exposed to contamination by the feces
 - 2- the mucosa of the female urethra is more susceptible to infection and more readily infected especially during sexual intercourse.
- Pregnant ladies might get an asymptomatic UTI
- Underlying diseases in male especially after the age of 40 predispose the UT mucosa to UTI
- Men with a UT infection should be given more care and attention than women and any case of urinary tract infection should be dealt with seriously albeit simple it may appear to be.
- Manifestations are related mainly to inflammatory reactions in parts of the UT.
- High concentrations of bacteria cells are suggestive of inflammatory reactions and pus cells in the UT.

Bacteriuria: presence of bacteria in urine

Pyuria: presence of pus cells in urine(WBCs)

Dysuria: burning, frequent & painful urination with pyuria(the no. of WBCs is important) and bacteriuria. Sometimes we might find pyuria without bacteriuria. This happens because of an underlying disease in another part of the body or because we couldn't find the causative agent by urinary culture.

Cystitis:

- inflammation of the lower urinary tract(bladder,urethra)
- the lower part of the urethra can be easily infected with bacteria from the feces, especially e. coli.

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Pyelonephritis :

- Inflammation of the kidney, the calyces and pelvis of ureter(wiki)
- This is a very serious condition. Renal failure and death occur if the patient doesn't receive the necessary treatment.
- It must always be treated in the hospital.
- Sepsis is uncommon(only 1-2%)(in infants, following surgery, after catheterization)

-Might complicate pneumonia and sepsis here the drug is IV antibiotics

Types of UTI :

- 1) community UTI .. 95% of UTI cases
- 2) Nosocomial infections

- in the community acquired UTI causative agent is one of the intestinal flora (Auto infection)

-E.coli (facultative anaerobic) is the most prevalent type of bacteria in the intestine tract, therefore any contamination of the external parts of the UT (vagina and penile urethra but in this case vagina is more readily contaminated) will result in ascending infection

A number of E.coli strains(uropathogenic E.coli) have attachment factors (factor 1 and 2)and these are responsible for such infections and these constitutes around 10-20 percent of E.coli strains(other strains 80-90 doesn't cause infection).

-Staph. (Coagulase – ve)is an important cause of infection in young ladies less than 18 years (it's part of skin flora so any change in the PH of the vagina or in association with folly's catheter)

-Enterococcus in the last 20 years became more imp due to the usage of 2nd and 3rd generations of cephalosporins

-Strains which cause nosocomial infection (klebsiella proteus morganelle etc...) are more important as a cause for UTI because:

1)the are more resistant to Antibiotics than other strains like E.coli (Multi resistant types)

2) they can survive the hospital environment (nosocomial infections)

Strept. Species aren't usually associated with UTI but group B might be due to the fact that it is part of the vagina's normal flora.

- 50% of pts with UTI received unnecessary Treatment and this depends on how the laboratory results are presented

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Lab Diagnosis :

Routine Microscopic Fresh Urine analysis:

- clean fresh midstream urine should be collected. The physician should instruct the patients how to collect such sample(void first portion then collect the second portion). Some physicians prefer to have both midstream and full urine samples.
- Urine samples are better collected in the morning(after waking up) because bacteria would have during sleep(there is no voiding or flushing)(يعني يكون البول تخمر!)
- Before collecting the sample, the patient should clean the external genitalia with running water for one minute.(he must not use detergents or alcohol because they might interfere with the sample)
- Sample should be examined with one hour of collection or refrigerated for ≤ 24 h.
- The urine sample will be centrifuged for 3-5 mins sediment will be used for culture and protein analysis. Sometimes we directly culture the sample to prevent contamination.
- We use at least 2 culture media: a universal medium like blood agar and a special gram -ve medium like macconkey agar.
- We can use a medium to identify lactose fermenting bacteria.
- We find WBCs in the sample to say that there is an infection.(> 8 WBCs /phf: most probably an infection)
- If there are no WBCs in the sample, the sample has most likely been contaminated.

Other routine tests:

Testing pH of the sample(normal pH is 5 - 6.5): alkaline urine is associated with infections

Testing for presence of protein or sugars.

Sometimes it is difficult to collect a urine sample from the patient using the usual method, so we collect suprapubic urine(to collect urine directly from the urinary bladder). In this case, a single colony means infection(remember that urine is normally sterile)

*most causative agents grow within 24 hrs in a culture but rarely some might take up to 48 hrs to grow.

We have an Acute , chronic and asymptomatic UTI

- It's very imp to distinguish between symptomatic and asymptomatic UTI

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Acute UTI:

- Identified by having a large no. of colonies in a culture
 - at least 100,000 bacteria/ml with >8 WBCs/phf
 - The bacteria most often seen in UTIs are of fecal origin
 - 80-90% caused by E.coli
 - 2nd most common cause of acute UTI is Coagulase-negative Staphylococcus (incidence increases in married females but the dr didn't say why)
 - Other causes like gram -ve (Klebsilla, Enterobacter, Proteus) or gram +ve (Enterococci fecalis) bacteria.
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- Klebsilla is the second most common g-ve bacteria after e. coli to cause acute UTI.
 - If we find P. aeruginosa in the culture of a patient that developed the infection outside the hospital we assume that the sample was contaminated with it before the culture and we redo the culture.
 - if the infection happened inside the hospital, we expect that the patient got infected with the bacteria commonly found in the hospital environment. Infections with multidrug resistant bacteria (P. aeruginosa, Proteus spp., Klebsilla-Enterobacter spp. Enterococcus sp) is common. (gram +ve (Enterococci fecalis) inf. is more common and staphylococcus inf. is less common inside the hospital than outside).

Asymptomatic and chronic UTI:

- small no. of colonies
- no. of bacteria ranges from 20,000 to 100,000.
- Asymptomatic has no WBCs and chronic has few WBCs (<8 WBCs/phf)
- In order to say that the patient has chronic or asymptomatic, you must do the culture twice (especially when we have no WBCs) and have the same result in both in order to rule out the possibility of contamination.
- Mixed bacterial culture often indicates contamination except in post surgery patients and patients that have foley's catheter.

*Pregnancy is usually associated with UTI and which are mostly asymptomatic (patient might suffer from mild fever and burning sensation during urination etc.) (cannot be confirmed without culture)

*Predisposing factors for UTIs:

- pregnancy
 - underlying disease
 - some antimicrobial drugs
 - female gender (female to male ratio= 30:1)
 - kidney stones
 - congenital abnormalities in the UT. (mainly in children)
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- In order to get a quantitative culture you need to culture 0.1 ml of urine

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- Gram stain can help in some cases where the pt needs to start a quick tx
- In the asymptomatic UTI u might not get a heavy load in the culture , so we need to return to the history of the pt to tell if this is a UTI or not , if the pt is taking any antibiotic might decrease the load of the microorganisms
- The low count might also indicate chronic infection .
- In 99% the UTI is caused by facultative anaerobic bacilli (E.coli ..)
- Rarely caused by candida or anaerobes unless there is an obstruction
- Usually the infection is by 1 type of microorganisms
- If there was multi organisms this might be due to the usage of foley's catheter , obstruction or a contamination
- In infants up to 1 year : it's hard to collect urine sample and the only way to get a sample is suprapubic approach and here we don't rely on the count but the presence of ANY microorganism indicates infection because urine is sterile in the UB

Treatment of UTI is not easy.the doctor must have a thorough idea about the pattern of susceptibility in the community

Treatment:

A good physician must always ask the patient if this is the first time he suffers from a UTI or not? If it's the first time, there is no need for culture. The physician will give the patient a drug that is, according to studies of prevalence of disease in a certain country/region, most suitable for this region. Sadly, most of the physicians in Jordan do not follow the recent studies and just give the patients drugs according to their personal experience or what they learned from drug companies. The rate of failure in treatment is 20%. these patients will suffer from a recurrent infection.

Antimicrobial drugs:

Augumentin, trimethoprim-sulfamethoxazole, nitrofurantoin(an excellent drug but not always available in Jordan), nalidix acid ,Norfloxacin/ Ciprofloxacin.

if the patient still complains from UTI >> you have to administer him to the hospital and to do a repeated cultures to give a specific Tx.

There is no vaccine

Sexually transmitted diseases :

-The number of cases of sexually transmitted diseases (STDs), continues to increase dramatically worldwide.

-In the past, gonorrhoea and syphilis were the most common STDs, but with the discovery and antibiotics they became less common and less dangerous. Nowadays the most common causes of STDs are pathogens that were undetectable by the technology of that time.

-According to the statistics done by the WHO, at least 500 million new cases every year.

-In Jordan, we don't know the exact no. of cases since the private laboratories don't report the cases they find and many of the patients who know they have the disease don't go to hospitals for whatever reason they have. Many of the cases are discovered by accident.

*STDs are associated with infertility.

-Many organisms are associated with STD : gonorrhoea , syphilis , Chlamydia , ...

-Some can be easily cultured

-N.gonorrhoea :

is the only one that really shows increasing resistance towards different types of antibiotics and it's very easily to be distinguished as a cause of STD In males depending on the clinical picture (severe pain during urination and discharge) but in females more than 50 % of the cases are asymptomatic

the infection follows a direct sexual contact , and it might infect the oral cavity .

if the pregnant lady was infected by Gonorrhoea she might pass the infection to the baby during delivery and this leads to infecting the cornea .

gonorrhoea is recognized in acute form in males but In females it's mostly chronic and asymptomatic

intracellular diplococci within the WBCs

we should not rely on the Gram stain alone .