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Urinary tract infection in pregnancy

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6th stage
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The urinary tract is the system of organs and tissues involved with regulation of water content and salt concentration in the body and with the excretion of metabolic wastes and excess water and salt in the form of urine. The urinary tract consists of the kidneys, bladder, ureters, and urethra.
A urinary tract infection (UTI) is an infection caused by pathogenic organisms (for example, bacteria, fungi, or parasites) in any of the structures that comprise the urinary tract (kidneys, ureters, bladder, urethra).
1. Upper urinary tract infection (pyelonephritis):- kidney infection.

2. Lower urinary tract infection:-
   bladder (cystitis)
   urethra (urethritis)
According to the symptoms:-

An urinary tract infection (UTI): Bacteriuria

1. presence of at least 100,000 organisms/mL of urine in an asymptomatic patient ((asymptomatic bacteriuria)).

2. more than 100 organisms/mL of urine with accompanying pyuria (>7 WBCs/mL) in a symptomatic patient ((symptomatic bacteriuria)).
Specimen bottle of urine from a patient, showing slightly cloudy urine due to the presence of white blood cells (pyuria). Pyuria usually indicates infection in either the kidney or urinary tract.
Another classification:-

- **Uncomplicated**: normal renal tract, normal function.

- **Complicated**: abnormal renal/GU tract, voiding difficulty/outflow obstruction, decrease renal function, impaired host defences.

- **Recurrent UTI**: occurs after successful therapy for a UTI, is caused by bacteria from outside the urinary tract and characterized by varying, delayed recurrence with different strains.

- **Relapse UTI**: is caused by bacteria that persist within the urinary tract despite antimicrobial therapy and characterized by rapid recurrence **2 WEEKS** with the same strains.
In pregnant women, the incidence of UTI can be as high as 8% (some reports, about 2 to 4% of pregnant women develop a urinary tract infection).

Overall, UTIs are 14 times more frequent in women than in men.

A difference between pregnant and nonpregnant women is that the prevalence of asymptomatic bacteriuria in pregnant women is 2.5-11%, as opposed to 3-8% in nonpregnant women.
Usually the Pregnancy is associated with **anatomic** and **physiologic** changes in the urinary system.

The physiologic changes of pregnancy predispose to bacteriuria. These changes include urinary retention caused by the weight of the **enlarging uterus** and **urinary stasis** due to **progesterone**-induced ureteral smooth muscle relaxation.
• Loss of ureteral tone combined with increased urinary tract volume results in urinary stasis, which can lead to dilatation of the ureters, renal pelvis, and calyces. Urinary stasis and the presence of vesicoureteral reflux predispose some women to upper tract UTIs (acute pyelonephritis).

• Increases in urinary progestins and estrogens may lead to a decreased ability of the lower urinary tract to resist invading bacteria.
• **Amino aciduria** is common in normal pregnancy.

• Up to **70** percent of pregnant women develop **glycosuria** (media for growth of bacteria).

• **These factors may all contribute to the development of UTIs during pregnancy**
Why are UTI's more common during pregnancy?

Women are particularly susceptible to urinary tract infections or UTI. This is because women have a shorter urinary tract than men.

UTIs are more common during pregnancy because of changes in the urinary tract. The uterus sits directly on top of the bladder. As the uterus grows, its increased weight can block the drainage of urine from the bladder, causing an infection.

Pregnant women are at increased risk for UTIs. Beginning in week 6 and peaking during weeks 22 to 24.
Bacteria are usually the cause of UTIs. Normally a person's urine does not contain bacteria. Bacteria are naturally present on the skin, in the lower bowel and in the stool itself. Sometimes bacteria from one of these sources enter the urinary tract system. Once there, they multiply and cause pain and irritation.

*Escherichia coli* infection is the most common cause of UTI, accounting for approximately 70-90% of cases. It originates from fecal floras that colonize the periurethral area, causing an ascending infection. *Klebsiella*, *Enterobacter*, and *Proteus* species cause most of the remaining cases.
Gram-positive organisms, particularly *Enterococcus faecalis* and group B *Streptococcus* (GBS), are also clinically important pathogens.

Infection with *Staphylococcus saprophyticus*, an aggressive community-acquired organism, can cause upper urinary tract disease, and this infection is more likely to be persistent or recurrent.
Chlamydial infections are associated with sterile pyuria and account for more than 30% of nonbacterial UTIs.

- chlamydia infection can be passed on to their newborn children, where it can cause:
- eye infections and
- pneumonia.
UTI in Pregnancy: Group B Streptococcus Infection

- Group B streptococcus (GBS) are bacteria that can be found in the digestive tract, urinary tract, and genital area of adults. Although GBS infection usually causes no problems in healthy women before pregnancy, it can cause serious illness for the mother and baby during pregnancy and after delivery.

- In the pregnant mother, GBS can cause a urinary tract infection and lead to preterm labor and birth.
• Group *B streptococcus* diagnosed can be cultured from a mother's urine. Cultures are usually done between 35 and 37 weeks of pregnancy and may take a few days to complete. Cultures collected earlier in pregnancy do not accurately predict whether a mother will have GBS at delivery.

• **GBS** colonization has important implications during pregnancy. *Intrapartum transmission* that leads to neonatal GBS infection can cause, meningitis, sepsis, and death.

• pregnant women with GBS bacteriuria should be treated as GBS carriers and should receive a **prophylactic antibiotic during labor** *(penicillin)*.
Group B Streptococcus
Summary of causes

1 - *E. coli* :- most common (70%-90%).

2 - *Group B streptococcus* :- (5%-10%).

3 - *Klebsiella or Enterobacter species* :- (3%).

4 - *Proteus species* :- (2%).

5 - *Others* :-
   - *Staphylococcus saprophyticus.*
   - *Staphylococcus aureus.*
   - *N. gonorrheea.*
   - *Chlamydia trachomatis.*
   - *Enterococcus faecalis.*
   - *Gardnerella vaginalis.*
   - *Ureaplasma ureolyticum.*
   - *Candidal infection.*
   - *Viral* :- rare.
FACTORS LEAD TO UTI IN PREGNANCY & POSTPARTUM

- Urine stasis during pregnancy.
- Perineal discomfort in postpartum period due to tears / episiotomy / injury.
- Bladder insensitivity to increased urinary tension in immediate postpartum period.
- Catheterization due to overdistension.
Risk factors of UTI

- A new sex partner or multiple partners.
- More frequent intercourse.
- A history of diabetes, sickle-cell anemia, stroke, kidney stones or any problem that causes the bladder not to empty completely.
- Pregnancy increases your risk for developing a UTI.
- Use of contraceptives such as diaphragms, condoms exposure and spermicides.
• A history of UTI's, especially if the infections were less than six months apart.

• Waiting too long to urinate.

• Decrease host defences (immunosuppression, DM)

• Urinary tract: obstruction; stones; catheter; malformation.
Cystitis

- Acute cystitis involves only the lower urinary tract; it is characterized by inflammation of the bladder due to bacterial infection. Acute cystitis develops in approximately 1% of pregnant patients.

- Common symptoms: **Suprapubic pain, urgency, frequency** and **dysuria**.

- Mucopurulent cervicitis usually **co-exists**.

- **Haematuria/pyuria** are present.
• Chills, fever, sweats, leaking of urine (incontinence).

• Waking up from sleep to urinate.

• Change in amount of urine, either more or less.

• Urine that looks cloudy, smells foul or unusually strong.

• Pain, pressure, or tenderness in the area of the bladder.
• Cystitis may evolve rapidly into a kidney infection (pyelonephritis).

• Pyelonephritis, in turn, may cause preterm labor, bacterial invasion of the bloodstream (sepsis).
Inflammation

Normal bladder surface

- Fat cells
- GAG Layer
- Lamina propria
- Tunica adventitia
- Urothelium
- Tunica muscularis

GAG islets
Mast cells and leucocytes
Inflamed Area
Nerve fibres
Acute complicated cystitis
Acute urethritis involves inflammation and infection of the urethra, the canal through which urine flows from the bladder out of the body. It is usually caused by: *E. coli*, *Neisseria gonorrhoeae* (gonorrhea), or *Chlamydia trachomatis* (chlamydia). 

E. coli, one of many bacteria normally present in the rectum and vagina, may be introduced into the urethra during intercourse or when wiping after a bowel movement. The gonorrhea and chlamydia bacteria are transmitted by sexual contact with an infected partner.
Patients with acute urethritis typically have the following urinary symptoms:

- **frequency** (the need to urinate often);
- **urgency** (the need to urinate immediately);
- **hesitancy** (delay in starting the stream of urine);
- **Dribbling** or painful urination, known as **dysuria**.

When **gonorrhea** or **chlamydia** bacteria cause the infection, a yellow, **pus-like discharge** from the urethra may be present.
Women with urethritis are at risk for the following complications:

- Cervicitis.
- Cystitis
- Miscarriage.
- (PID).
- Pyelonephritis
- Salpingitis (infection of the Tubes)
Acute pyelonephritis

- Potentially **life threatening** in pregnancy.

- In contrast to non-pregnant, acute pyelonephritis in pregnancy leads to acute renal failure if not treated.

- Pyelonephritis is the most common urinary tract complication in pregnant women, occurring in approximately 2% of all pregnancies. Acute pyelonephritis is characterized by **fever**, **flank pain**, and **tenderness** in addition to significant **bacteriuria**.
• Other symptoms may include nausea, vomiting, frequency, urgency, and dysuria.

• pyuria + bacteriuria are present.

• 15% of APN also have *bacteraemia*.

• **Oliguria** (if acute renal failure).

• Pyelonephritis that has progressed to urosepsis may be accompanied by signs of septic shock, including rapid breathing, decreased blood pressure, shivering, and occasionally delirium.
Acute pyelonephritis:

Complications:-

- Perinephric cellulitis or abscess
- Septicaemia
- Septic shock
- ARDS
- Death
- PROM
- Fetal death
Acute Pyelonephritis

- Gross examination of kidney
  - Variable numbers of small, yellowish white cortical abscesses, spherical, < 2 mm, sometimes surrounded by zone of hyperemia
  - Most often on sub-capsular surface
  - In the medulla, yellow white linear streaks that converge on the papilla
  - Pelvicalyceal mucosa may be hyperemic or covered with a fibrinopurulent exudate

*Restricted use. Source: PEIR: University of Alabama at Birmingham, Department of Pathology*
Neonatal outcomes that are associated with UTI include sepsis and pneumonia (specifically, group B streptococcus infection), intrauterine growth retardation.

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Diagnosis of UTI

1. **Hx Taking and examination + temperature + abdominal examination + assessment of costovertebral angle for tenderness.**

2. **CBC, electrolyte, blood urea nitrogen (BUN), and creatinine tests.**

3. **Urine C&S**: Culture results can be used to identify specific organisms and antibiotic sensitivities. (Should be performed in all pregnant women)

4. **Urine analysis (dipstick)**: Positive results for nitrites, leucocytes esterase, WBCs, RBCs, and protein suggest UTI.

5. **Imaging Studies**: Unless anatomic abnormalities or renal disease is suspected, routine imaging studies are not necessary.
E. coli
pyuria
Urine dipstick
Differential diagnosis:

- Cervicitis.
- Chlamydial genitourinary infections.
- Ectopic pregnancy.
- Renal stone.
- PID.
- Trichomoniasis.
- Vaginitis.
- Glomerulonephritis
- Group B streptococci colonization.
- Sexually transmitted infection (eg, gonorrhea, nongonococcal urethritis).
- Threatened or incomplete miscarriage.
• Administration of appropriate antibiotics.

• Administration of fluid if the patient is dehydrated.

• Anti pyretics :- for fever.

• Anti emetic :- for nausia and vomiting.

• Strongly consider admission if there is any indication of renal involvement.
<table>
<thead>
<tr>
<th>Drug Regimen</th>
<th>Dosage and Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin 250 mg tid for 3-7 days OR Amoxicillin 500 mg bid for 3-7 days</td>
<td></td>
</tr>
<tr>
<td>Nitrofurantoin monohydrate macrocrystals 100 mg bid for 3-7 days</td>
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<tr>
<td>Cephalexin 500 mg bid to qid for 3-7 days</td>
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</tr>
<tr>
<td>Amoxicillin-clavulananate 500 mg bid for 3-7 days OR Amoxicillin-clavulanate 250 mg tid for 3-7 days</td>
<td></td>
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<tr>
<td>Trimethoprim-sulfamethoxazole 180/600 mg† One double-strength tablet bid for 3-7 days</td>
<td></td>
</tr>
<tr>
<td>Cefpodoxime 100 mg bid for 3-7 days</td>
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</tbody>
</table>

* Recommended to avoid during third trimester.
† Only in second trimester.
Source: Reference 9.
the patient may experience a reinfection of the urinary tract from the rectal reservoir. UTIs recur in approximately 4 to 5 percent of pregnancies, and the risk of developing pyelonephritis is the same as the risk with primary UTIs. A single, postcoital dose or daily suppression with cephalexin or nitrofurantoin in patients with recurrent UTIs is effective preventive therapy.
Urethritis

- If \textit{E. coli} is the suspected cause of infection, you will be treated with \textit{trimethoprim-sulfamethoxazole} double strength \textit{twice daily} for three days or \textit{nitrofurantoin monohydrate macrocrystals} (Macrobid) \textit{twice daily}.

- If \textit{gonorrhea} and/or \textit{chlamydia} is the suspected cause of infection, the most cost-effective treatment is a single, oral dose of \textit{cefixime} or injection of \textit{ceftriaxone} for \textit{gonorrhea}, plus a single oral dose of \textit{azithromycin} (Zithromax) for \textit{chlamydia}. 
Management of the Pregnant Women With Acute Pyelonephritis

1. Hospitalization.
2. Urine studies.
3. Hemogram, serum creatinine, and electrolytes.
4. Monitor vital signs frequently, including urinary output; consider indwelling catheter.
5. Intravenous crystalloid to establish urinary output 50 mL/hr.
6. Intravenous antimicrobial therapy.
7. Chest radiograph if there is dyspnea or tachypnea.
8. Repeat hematology and chemistry studies at 48 hours if clinically relevant.
9. Change antimicrobials if necessary when sensitivity results are available.
10. Discharge when afebrile for 24 hours; administer antimicrobials 10 days total therapy.
11. Urine studies 1–2 weeks after therapy completed to “test for cure”.

Drink **6-8** glasses of water each day and eliminate refined foods, fruit juices, caffeine, alcohol, and sugar.

Take **Vitamin C** (250 to 500 mg), Beta-carotene (25,000 to 50,000 IU per day) and Zinc (30-50 mg per day) to help fight infection.

Develop a habit of urinating as soon as the need is felt and **empty** your bladder completely when you urinate.
• Urinate before and after intercourse.

• Avoid intercourse while you are being treated for an UTI.

• After urinating, blot dry (do not rub), and keep your genital area clean. Make sure you wipe from the front toward the back.

• Avoid using strong soaps, douches, antiseptic creams, feminine hygiene sprays, and powders.

• Avoid wearing tight-fitting pants.

• Don't soak in the bathtub longer than 30 minutes or more than twice a day.
Thank you