Obs and Gynae PG Focus Series

Renal Disorders in Pregnancy

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Urinary Tract Infection in Pregnancy

INTRODUCTION

Urinary tract infection is a common ailment in pregnancy. It can be either symptomatic or asymptomatic, making it difficult to diagnose. It is an area of concern for an obstetrician, as it affects the maternal and perinatal morbidity and mortality.

Normal urine is sterile, but practically, it is difficult to collect as it gets contaminated in the distal urethra. Logarithmic bacterial concentration of 10^4–10^5/mL is usually seen in infected urine. Conventionally, 10^5/mL counts were considered significant, where <1% corresponded to contamination. Bacterial counts of >10^4/mL can also be considered significant, but higher percentage of samples will be contaminated. Relatively, if a single uropathogenic strain (or one with only moderate contamination) is identified can a diagnosis be made.

It is necessary to minimize contamination to reach accurate diagnosis. Sterile suprapubic catheterization is gold standard for collection of uncontaminated urine. Collection using a sterile catheter also reduces the risk of contamination. But these methods are practically not convenient. Random urine samples have proven to be of limited use. Therefore, for all practical purposes, collection of midstream sample of urine after decontamination of meatus gives satisfactory results.

CLASSIFICATION

- *Asymptomatic bacteriuria*: Persistent colonization of the urinary tract by significant numbers of bacteria in women without urinary symptoms.
- *Acute cystitis*: Distinguished from asymptomatic bacteriuria by the presence of symptoms such as dysuria, urgency, frequency, nocturia, hematuria, and suprapubic discomfort in afebrile women with no evidence of systemic illness.
- *Pyelonephritis*: Significant bacteriuria in the presence of systemic illness and symptoms such as flank or renal angle pain, pyrexia, rigor, nausea, and vomiting.

INCIDENCE

- In pregnancy, the overall incidence of urinary tract infection (UTI) is approximately 8%.

- According to UK studies, the rate of asymptomatic bacteriuria in pregnant women is 2–5%.
- The incidence of acute cystitis is more difficult to accurately determine, as many women are treated empirically and culture not performed.
- The incidence of pyelonephritis during pregnancy is 2%.

ETIOLOGY

The following characteristics of urine make it bacteriostatic to most commensals:

- Relatively acidic pH
- High osmolality
- High urea concentration

Free antegrade flow through the ureteral and urethral valves maintains the sterility of urine.

Physiological changes occurring in pregnancy in the urogenital tract, increasing the potential for pathogenic colonization are as follows:

- Bladder volume increases
- Detrusor tone decreases
- Progestogenic relaxation of the ureteric smooth muscle and pressure from the growing uterus cause ureteric dilatation

Because of protection from the sigmoid colon and upper rectum, the left ureter is relatively spared. Increased urine stasis, weakened ureteric valves, and vesicoureteric reflux, on the other hand, enhance bacterial colonization and ascending infection.

- Glycosuria
- Physiological aminoaciduria of pregnancy
- Fall in urine osmolality

Sexual activity is a significant risk factor.

In urine, the majority of vulval and perineal commensal bacteria, as well as gram-negative bacteria from the intestine, flourish. As a result, aerobic gram-negative bacilli from the gastrointestinal system are responsible for the majority of urinary tract infections. A distended, gravid abdomen might make hygiene difficult, exacerbating the condition.

The prevalence of infection increases with age and lower socioeconomic class. Urinary tract anomalies and preexisting maternal diseases like diabetes further increase the risk of infection.

Urethral instrumentation and catheterization can further predispose to ascending infection.

BACTERIOLOGY

- *Escherichia coli* accounts for 80–90% of infections.
- Other gram-negative bacilli, such as *Proteus mirabilis* and *Klebsiella pneumoniae*, and Enterobacteriaceae

- Coagulase negative cocci, *Staphylococcus saprophyticus*, is the second most frequently cultured uropathogen
- Other gram-positive cocci, such as group B hemolytic streptococci, though less frequent, are clinically important.

Vaginal colonization with group B streptococci has been linked to preterm rupture of membranes, labor, and delivery, as well as being a known cause of newborn sepsis. Treatment of urinary group B streptococcal infection is associated with a significant reduction in preterm, prelabor rupture of membranes, and delivery rates.

CLINICAL MANIFESTATIONS

Asymptomatic Bacteriuria

Six percent of asymptomatic pregnant women who come in for their first antenatal visit have significant bacteriuria. Asymptomatic bacteriuria that goes untreated is linked to negative maternal outcomes such as symptomatic cystitis, pyelonephritis, premature labor and delivery, and negative fetal outcomes such as prematurity, low birth weight, and increased perinatal mortality.

There is increased risk of preeclampsia, anemia, chorioamnionitis, and postpartum endometritis. Fetal risks include fetal growth restriction, stillbirth, and perinatal mortality. Screening and effective treatment significantly reduce the incidence of pyelonephritis, premature delivery, and low birth weight.

Urine microscopy and reagent strip analysis, urine-based screening tests like interleukin-8 test, rapid enzymatic test, chromogenic limulus amoebocyte lysate assay, and semi-automated urine screen are used as screening tests for asymptomatic bacteriuria. According to the Royal College of Obstetricians and Gynaecologists (RCOG), none of these approach the sensitivity and specificity of urine culture and, as a result, cannot be recommended as screening techniques for asymptomatic bacteriuria during pregnancy.

Routine midstream sample of urine utilized for screening of asymptomatic bacteriuria in early pregnancy, is a Grade A recommendation of the RCOG. In women who have been diagnosed with and treated for asymptomatic bacteriuria, follow-up cultures should be done because urine may not be sterile throughout the pregnancy.

ACUTE CYSTITIS

Acute cystitis affects about 1% of all pregnant women. This condition is distinguished from asymptomatic bacteriuria by the presence of symptoms such as dysuria, frequency, urgency, and suprapubic pain in the absence of systemic disease. Acute cystitis develops in 30% of women with asymptomatic bacteriuria during pregnancy.

The presence of nitrites in symptomatic women's urine clearly suggests severe bacteriuria. The presence of nitrite on a dipstick may be enough to trigger the start of empirical antibiotic treatment.

Women who suffer from vulvitis, vaginitis, or cervicitis as a result of herpes simplex can also present with acute cystitis symptoms. As a result, an accurate physical examination must be undertaken in addition to a thorough clinical history.

PYELONEPHRITIS

Pyelonephritis is the most dangerous type of urinary infection in pregnancy, with a prevalence of about 2%. The last two trimesters are when the majority of prenatal cases occur.

Pyelonephritis is an infection of a renal papilla that can spread to several papillae and, in rare cases, the renal cortex if left untreated. When the whole kidney is infected, pyonephrosis develops; if the capsule ruptures, a perinephric abscess can develop. Septic shock and gram-negative septicemia, both of which can lead to multiple organ failure, are significant complications.

Renal biopsy is the gold standard for diagnosing pyelonephritis, however it is impracticable in actual practice. The diagnosis is made using a combination of symptoms, a complete blood count, inflammatory markers, renal function tests, blood culture, urine culture, and sensitivity testing.

TREATMENT

Asymptomatic Bacteriuria

Treatment reduces the incidence of pyelonephritis in pregnancy and, as a result, the risks of preterm delivery and low birth weight, according to a Cochrane review.

Acute Cystitis

Most pregnant women with acute cystitis seek medical help right away. For pregnant women with symptomatic urinary infection, increasing oral fluid intake is generally recommended as a first-line treatment. This is recommended until the results of the cultures and antibiotic sensitivity tests are received. It can make symptomatic women's urine frequency and dysuria worse.

Urine alkalinizing drugs have also become popular for the treatment of urinary symptoms in women, however the benefits of such treatments have yet to be proven.

Empirical antibiotic therapy is frequently started before the findings of urine culture and sensitivity tests are available. Once the culture findings are known, it is critical to reevaluate and adapt empirical treatment. In most cases, a 7–10 days treatment of a suitable antibiotic is sufficient. The recommended antibiotic agents are listed in **Box 1**.

BOX 1: Antibiotics used in urinary tract infection (UTI) in pregnancy.

For UTI:
- Ampicillin 500 mg QID
- Amoxicillin 250 mg TID
- Cephalexin 500 mg QID
- Cefaclor 500 mg QID
- Ceftriaxone 1 g intravenous (IV)

BOX 2: Analgesia used in pregnancy.

For analgesia:
- Acetaminophen (paracetamol) 500 mg for mild pain is preferred
- Morphine in small dose for severe pain can be used

Pyelonephritis

The majority of women with pyelonephritis need to be admitted to the hospital. Before beginning treatment, blood cultures (aerobic and anaerobic) should be performed, as well as vaginal swabs and a midstream specimen of urine (MSSU) for culture. Antimicrobial therapy is started on a trial basis, usually via parenteral administration. Initially, broad-spectrum therapy is used, with the treatment spectrum narrowed as culture and sensitivity reports become available. Parenteral treatment should be continued for at least 24 hours after the woman has become afebrile. If the lady does not respond within 24–48 hours and once culture and sensitivity findings are available, it is critical to reevaluate treatment.

Renal angle discomfort affects the majority of women, and analgesia may be required. Nonsteroidal anti-inflammatory drugs (NSAIDs) should be avoided because they have been linked to fetal risks of oligohydramnios and premature ductus arteriosus closure, and maternal risks of gastric mucosal ulceration and reduced renal perfusion.

Preterm labor is greatly increased by acute pyelonephritis. Tocolysis is a common occurrence. If there is a risk of preterm labor, antenatal steroids for fetal lung maturity should be considered.

Because relapses might occur after just 7 days of treatment, antimicrobial treatment for pyelonephritis should be continued for at least 10 days.

The recommended medications and their doses in pregnancy are given in **Box 1**.

The NSAIDs should be avoided during pregnancy for analgesia, according to the Food and Drug Administration (FDA). Although opioids can be utilized, the risk of addiction (neuroadaptation) and withdrawal must be considered. **Box 2** shows analgesics to be considered for reducing pain.

CONCLUSION

Urinary tract infections (UTIs) in pregnancy are a common and significant clinical concern due to the physiological changes in the urinary tract, including ureteral dilation, increased bladder residual volume, and urinary stasis. These changes predispose pregnant individuals to UTIs, which, if untreated, can lead to severe complications such as pyelonephritis, preterm labor, and adverse neonatal outcomes.

Early detection and appropriate management are critical. Screening for asymptomatic bacteriuria (ASB) is an essential component of antenatal care, as treating ASB can significantly reduce the risk of progression to symptomatic UTI. Antibiotic therapy should be guided by culture and sensitivity, with careful consideration of drugs safe for use during pregnancy.

A multidisciplinary approach, involving regular monitoring and patient education about hygiene practices, fluid intake, and prompt reporting of symptoms, can help mitigate the risks associated with UTIs in pregnancy. Addressing these infections effectively not only ensures maternal health but also supports optimal pregnancy outcomes.

SUGGESTED READING

1. Asscher AW, Sussman M, Waters WE, Davis RH, Chick S. Urine as a medium for bacterial growth. Lancet. 1966;2:1037-41.
2. Foley ME, Farquharson R, Stronge JM. Is screening for bacteriuria in pregnancy worthwhile? Br Med J. 1987;295:270.
3. Gilstrap LC 3rd, Cunningham FG, Whalley PJ. Acute pyelonephritis in pregnancy: an anterospective study. Obstet Gynecol. 1981;57:409-13.
4. Harris RE, Gilstrap LC 3rd. Cystitis during pregnancy: a distinct clinical entity. Obstet Gynecol. 1981;57:578-80.
5. Hooten TM, Stamm WE. Diagnosis and treatment of uncomplicated urinary tract infection. Infect Dis Clin North Am. 1997;11:551-81.
6. Mikhail MS, Anyaegbunam A. Lower urinary tract dysfunction in pregnancy: a review. Obstet Gynecol Surv. 1995;50:675-83.
7. Patterson TF, Andriole VT. Bacteriuria in pregnancy. Infect Dis Clin North Am. 1987;1:807-22.
8. Ronald A. Sex and urinary tract infections. N Engl J Med. 1996;335:511-2.
9. Royal College of Obstetricians and Gynaecologists. (2012). Sepsis in Pregnancy, Bacterial (Green-top Guideline No. 64a). [online] Available from https://www.rcog.org.uk/guidance/browse-all-guidance/green-top-guidelines/sepsis-in-pregnancy-bacterial-green-top-guideline-no-64a/. [Last accessed November, 2024].
10. Stirrat GM. Pregnancy and immunity. BMJ. 1994;308:1385.

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