

Acute Pyelonephritis



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Objectives



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- ❧ Etiology
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UTI Terminology



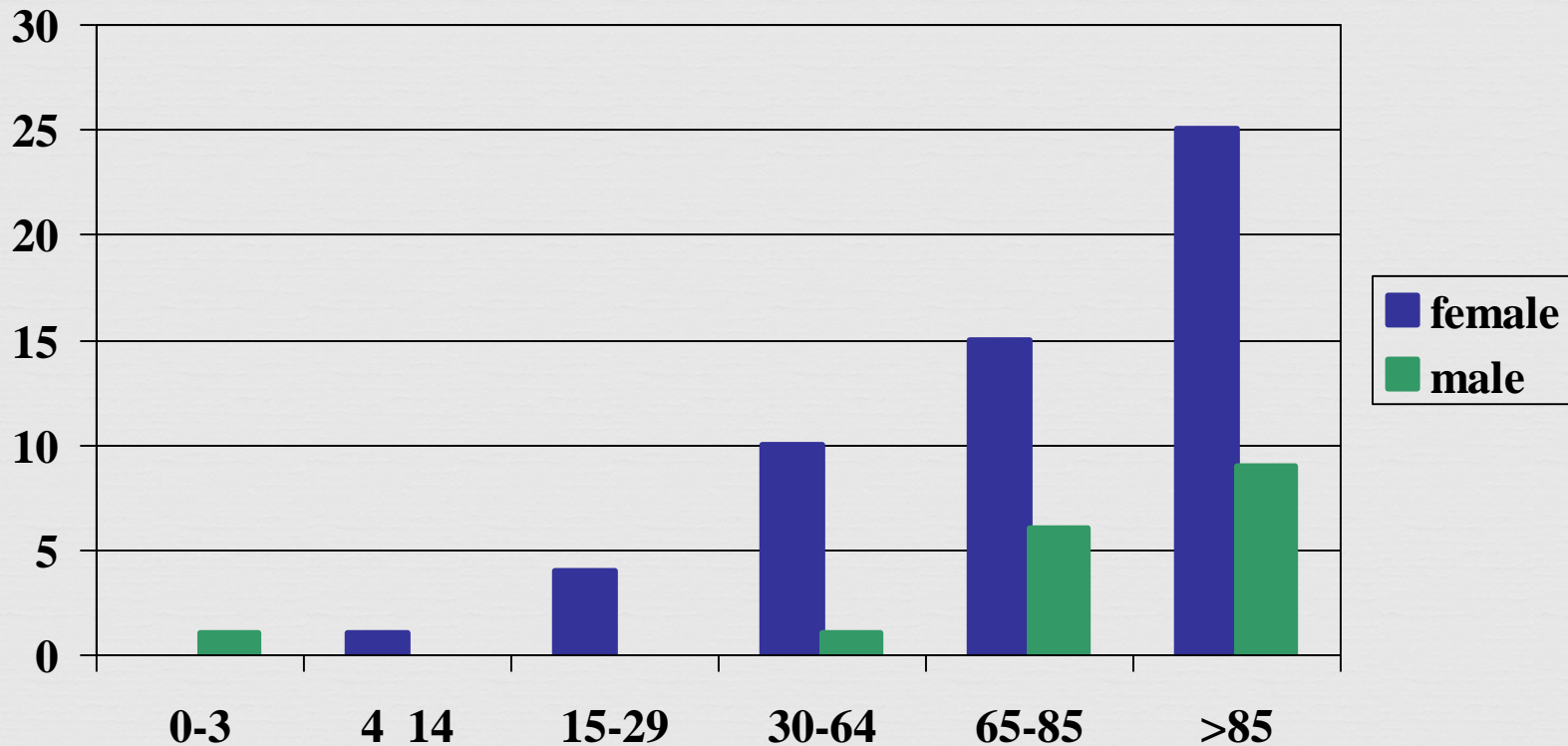
- ❧ **Uncomplicated:** infection of urinary bladder in host w/out underlying renal or neurologic disease
- ❧ **Complicated:** infection in setting of underlying structural, medical or neurologic disease
- ❧ **Recurrent:** > 2 symptomatic UTIs w/in 12 mos. following clinical resolution of each previous UTI after therapy
- ❧ **Reinfection:** recurrent UTI caused by different pathogen at any time or original infecting strain >13 days after therapy of original UTI
- ❧ **Relapse:** recurrent UTI caused by same species causing original UTI w/in 2 wks after therapy

Introduction



- ❧ It is very serious condition that lead to renal scarring, nephric, perinephric abscess formation, sepsis
- ❧ Clinical presentation is atypical in some patients
- ❧ Update on the management

Prevalence of bacteriuria in different age groups



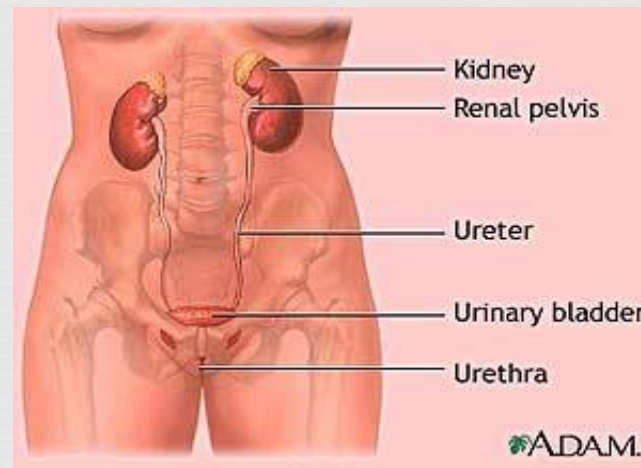
Risk Factors



- ❧ Pregnancy (1/2 of asymptomatic will develop pyelonephritis if not treated)
- ❧ Diabetes (10 time more admission)
- ❧ Immunosuppression
- ❧ Obstruction
- ❧ Catheterized patients

Definition

It is Bacterial infection of the renal pelvis, tubules and interstitial tissue of one or both kidneys



- Renal pelvis: pyelitis
- Renal parenchyma: pyelonephritis
- Bladder: cystitis
- Urethra: urethritis

Etiology



- ❧ *Escherichia coli*, which accounts for 70-90% of uncomplicated UTIs and 21-54% of complicated UTIs
- ❧ the uropathogenic *E coli* (UPEC) derives commonly from the phylogenetic groups B2 and D, which express distinctive O, K, and H antigens. UPEC genes encode several postulated virulence factors (VFs), including adhesins **P fimbriae** **pap+genotype** family, protectins, siderophores, and toxins
- ❧ *Staphylococcus saprophyticus*, *Klebsiella pneumoniae*, *Proteus mirabilis*, enterococci, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Enterobacter* species
- ❧ Rare *candida*, viruses, brucella and TB
- ❧ Host factors

Pathogenesis



- ❧ Ascending bacterial infection
- ❧ Hematogenous spread to kidney is rare
 - ❧ Exception: neonates with *Staphylococcus aureus*
- ❧ For optimal host defense function, intermittent & complete emptying of bladder must occur
 - ❧ Urine is excellent culture medium
 - ❧ Bactericidal secretion from uroepithelial cells and glycoproteins inhibit bacterial adherence
- ❧ Renal parenchyma infections result in inflammatory response to contain infection but contributes to potential scarring

Pathology



- ❧ Kidneys enlarge
- ❧ Interstitial infiltration of inflammatory cells
- ❧ Abscesses on the capsule and at corticomedullary junction
- ❧ Result in destruction of tubules and the glomeruli
- ❧ When chronic, kidneys become scarred, contracted and nonfunctioning

Symptoms and Signs



- ❧ Acute pyelonephritis may be unilateral or bilateral
- ❧ Flank pain (pain in the costovertebral angle) or tenderness or both, fever, chill and lower urinary tract symptoms (urgency, frequency and dysuria)
- ❧ Azotemia can occur
- ❧ Other non-infectious causes of these symptoms is renal infarct and calculi.



- ❧ In the chronic phase the patient may show unremarkable symptoms such as nausea and general malaise
- ❧ Systemic signs occur as a result of the chronic disease: elevated BP, vomiting, diarrhea.

Differential Diagnosis



- ❧ One fifth of the patients
- ❧ Acute pelvic inflammatory disease
- ❧ Ectopic pregnancy
- ❧ Diverticulitis
- ❧ Renal calculi

Complications



- ❧ Hypertension, septic shock, multi organs failure, death
- ❧ Renal or perinephric abscesses
- ❧ Metastatic infection
- ❧ Papillary necrosis
- ❧ Acute renal failure
- ❧ Emphysematous pyelonephritis
- ❧ Renal gangrene
- ❧ Localized or generalized atrophy/permanent loss of function

Diagnosis



- ❧ Diagnosis is confirmed by bacteria (10^8 /l or 10^5 /ml) and pus ≥ 10 /HPF (90%) and leukocytes esterase, RBCS 20-40% in the urine and leukocytosis
- ❧ A clean-catch or catheterized urinalysis with quantitative culture on BAP and selective media and sensitivity identifies the pathogen and determines appropriate antimicrobial therapy
- ❧ Blood culture 15-30%
- ❧ BUN and Creatinine levels of the blood and urine may be used to monitor kidney function
- ❧ IVP will identify the presence of obstruction or degenerative changes caused by the infection process
- ❧ Ultrasound or CT scan

Management



- ❧ Patients with mild signs and symptoms may be treated on an outpatient basis with antibiotics for 7-14 days
- ❧ Hospitalization in sever cases
- ❧ Empirical treatment is TMP-SMX (Resistance around 50%), fluoroquinolones is alternative
- ❧ Ampicillin with aminoglycoside or third generation cephalosporins, piperacillin or carbapenems in sever cases
- ❧ Antibiotics are selected according to results of urinalysis culture and sensitivity and may include broad-spectrum medications

Prevention



- ❧ Antimicrobial prophylaxis
- ❧ TMP-SMX or fluoroquinolones 3/week or nitrofurantoin daily
- ❧ Intravaginal estradiol
- ❧ 300 ml of cranberry juice
- ❧ Removal the urinary catheter as soon as possible or use condom catheter



Prognosis



- ❧ Prognosis is dependent upon early detection and successful treatment
- ❧ Baseline assessment for every patient must include urinary assessment because pyelonephritis may occur as a primary or secondary disorder