Acute Pyelonephritis

PROF. ALI SOMILY, MD, FRCPC

Objectives

- Introduction
- Epidemiology
- Definition
- Etiology
- Pathogenesis
- Pathology
- Clinical presentations
- Diagnosis
- Treatment and prevention
- Other Syndromes

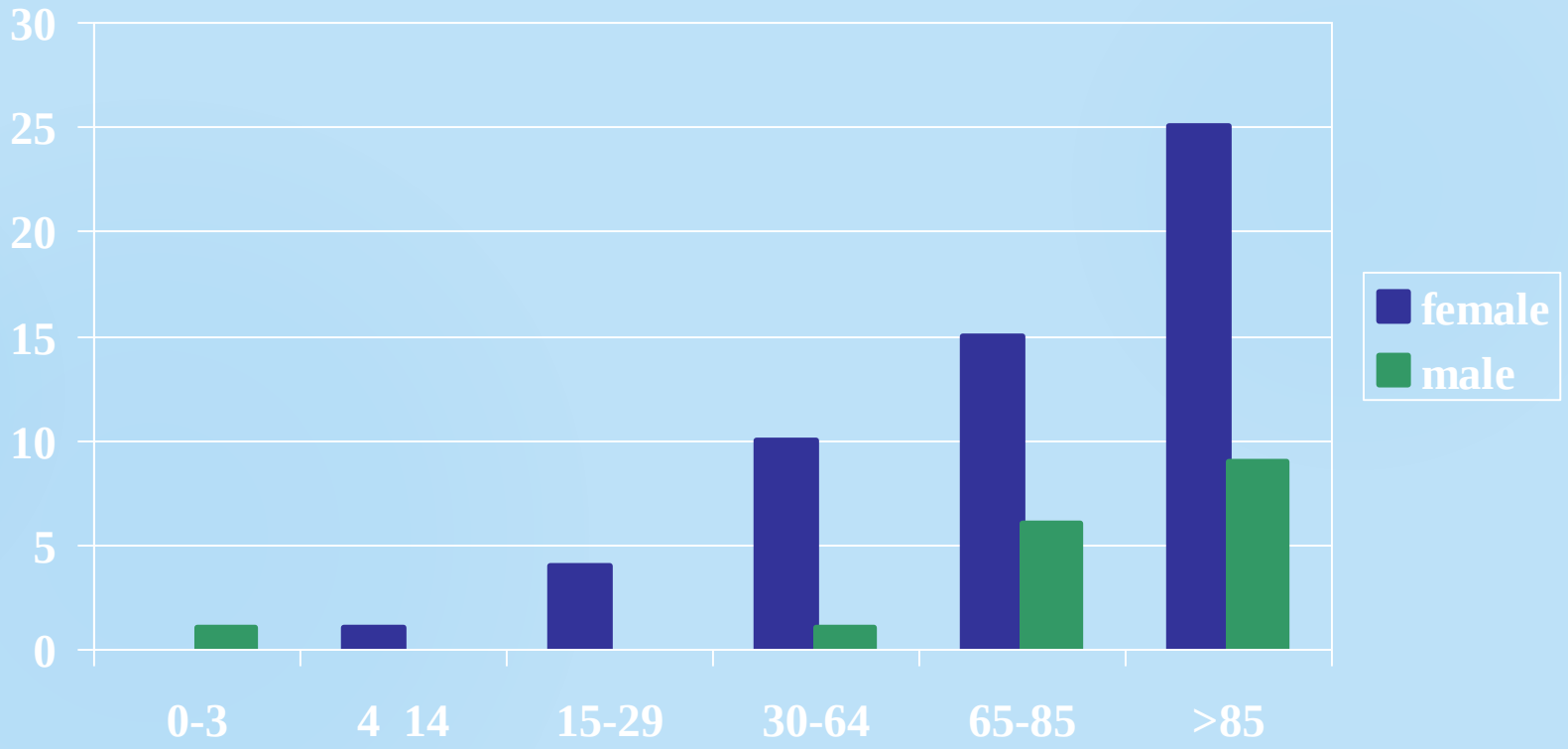
UTI Terminology

- **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 weeks 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

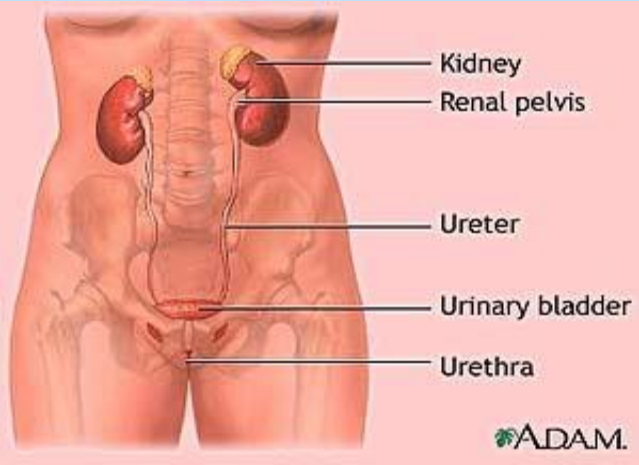


Risk Factors

- 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) erives 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 caliculi .

- 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 prinephric 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, pipracillin 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.