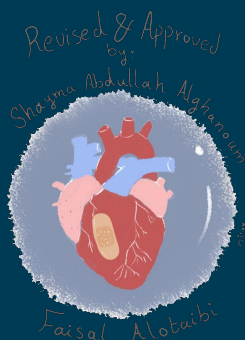


Pyelonephritis

TEAM 439

MICROBIOLOGY



Objectives

- ❖ Define pyelonephritis
- ❖ List risk factors
- ❖ Discuss the etiology and pathogenesis
- ❖ Describe signs and symptoms
- ❖ List potential complications
- ❖ Discuss the diagnosis, management and prevention

Colour index:

Red: Important

Grey: Extra info & explanation.

Purple: Only in girl's slides.

Orange: Only in boy's slides.

Green: Lecture notes

Any future corrections will be in the editing file, so please check it

frequently.

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introduction



- It is a very serious condition that can lead to renal scarring, nephric, perinephric abscess formation, sepsis
- Clinical presentation is atypical in some patients

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

Uncomplicated :

infection of urinary bladder in host without underlying renal or neurologic disease. Usually in female, non-pregnant, young, healthy.

Complicated:

infection in setting of underlying structural, medical or neurologic disease . Usually in female, pregnant , old age .

Recurrent:

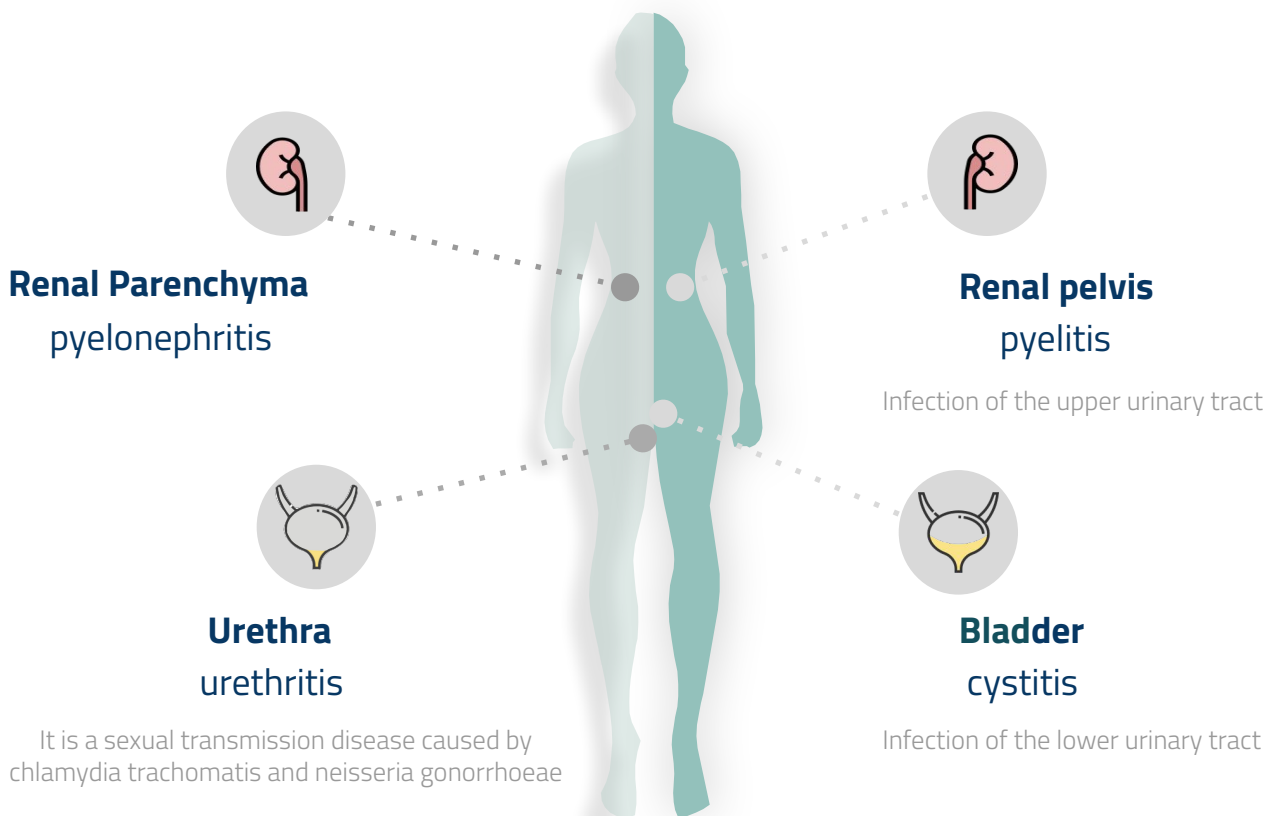
Patients with two or more symptomatic UTIs within 6 months or 3 or more over a year .

Relapse:

recurrent UTI caused by same species causing original UTI within 2 weeks after therapy. Less than 2 weeks and **same organism**

Reinfection:

recurrent UTI caused by different pathogen at any time or original infecting strain >13 days after therapy of original UTI. More than 2 weeks and **different organism**



Risk Factors :

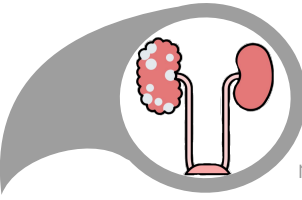
Pregnancy

Due to smooth muscle relaxation and vesicoureteral reflux ^[1]



Obstruction

Obstruction anywhere in renal system, but the most common cause of urinary tract obstruction is renal stone



Diabetes ^[2]

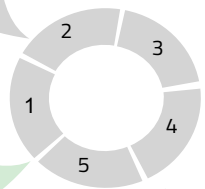
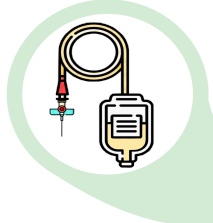


Immunosuppression



Catheterized Patients

Introduce the outside bacteria



Etiology :

Approximately it has the same organisms of cystitis, but the differences between these 2 disorders are mainly noticed in the signs and symptoms

1

Escherichia coli

- It is the most common in complicated UTI (21-54%) and uncomplicated UTI (70-90%)
- Uropathogenic E.coli (UPEC) have enhanced potential to produce UTI
- UPEC genes encode several virulence factors including :
 - Type 1 pilli
 - P pilli
 - Alpha hemolysin

Escherichia coli is common in bowel flora
Type 1 pilli and P pilli allow to adhere to the mucosa

2

- Klebsiella pneumonia
- Proteus mirabilis (associated with kidney stone)
- Enterococci
- Staphylococcus aureus
- Pseudomonas aeruginosa (hospital acquired infection)
- Enterobacter species

3

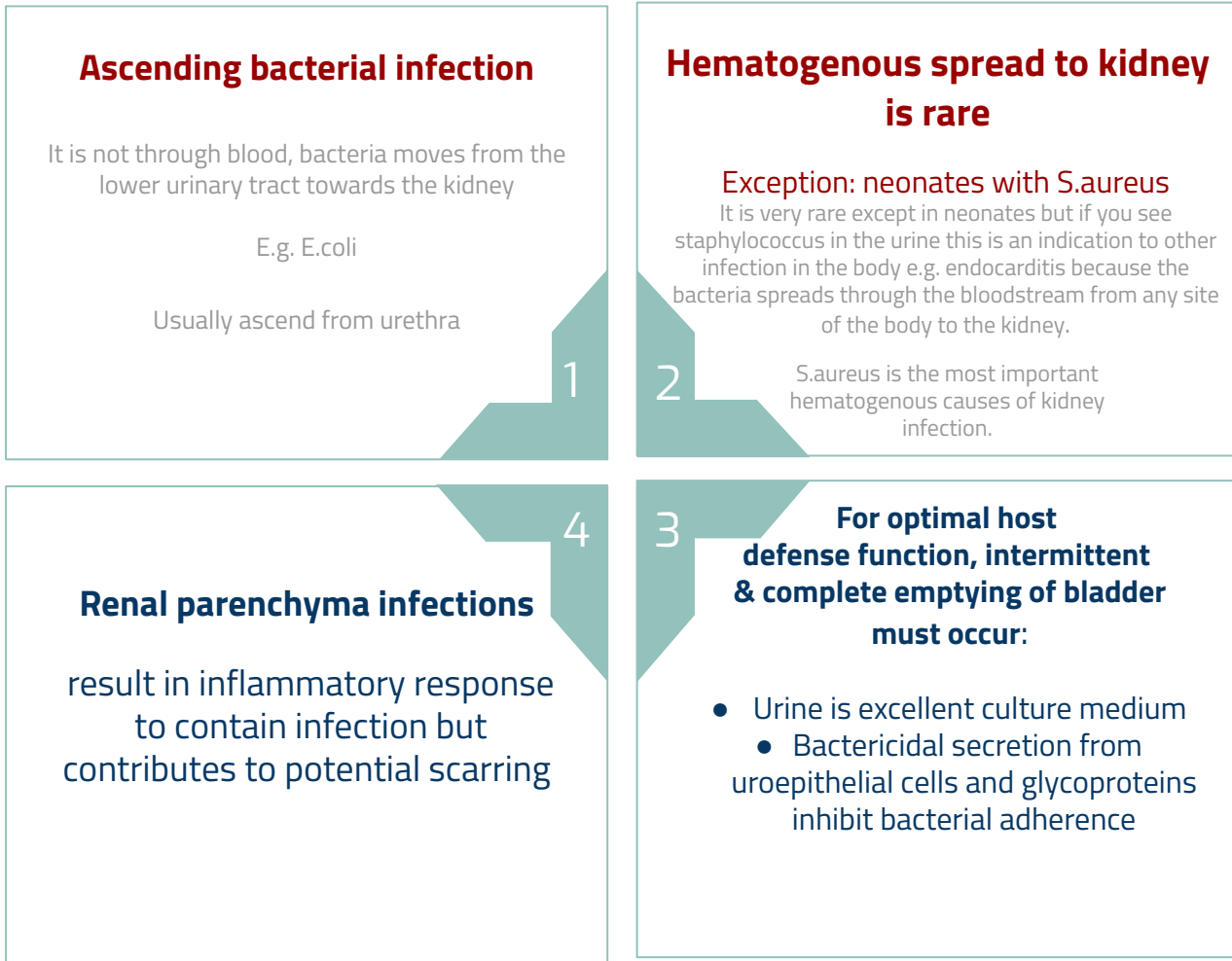
- Candida
 - Viruses
 - Brucella
 - TB(mycobacterium tuberculosis)
- They can cause UTI but rare
- TB can spread through hematogenous route.

^[1] Is a condition in which urine flows backward from the bladder into the ureters / kidney. It happens when the vesicoureteral orifice (the one way valve) fails

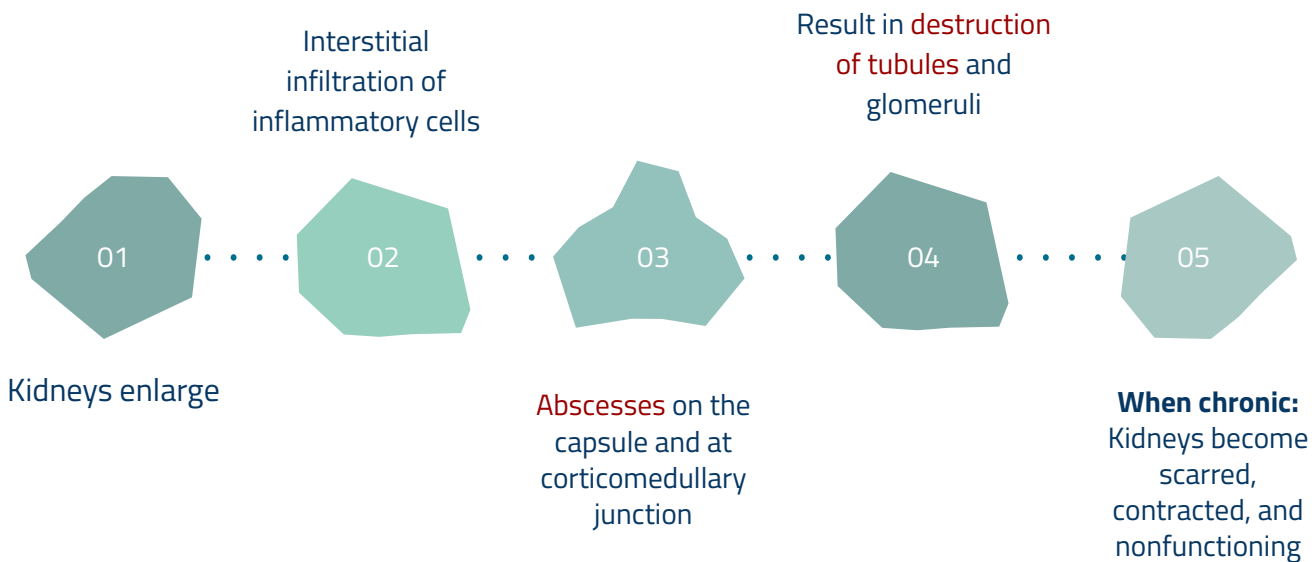
^[2] First reason: people with diabetes may have poor circulation which reduce the ability of white blood cells to fight off any kind of infection.

Second reason: diabetes may cause damage to nerves so people with diabetes have bladders that don't empty as well as they should. As a result urine stays in the bladder for a long time, you can develop an infection from the rapid growth of bacteria in urine.

Pathogenesis :

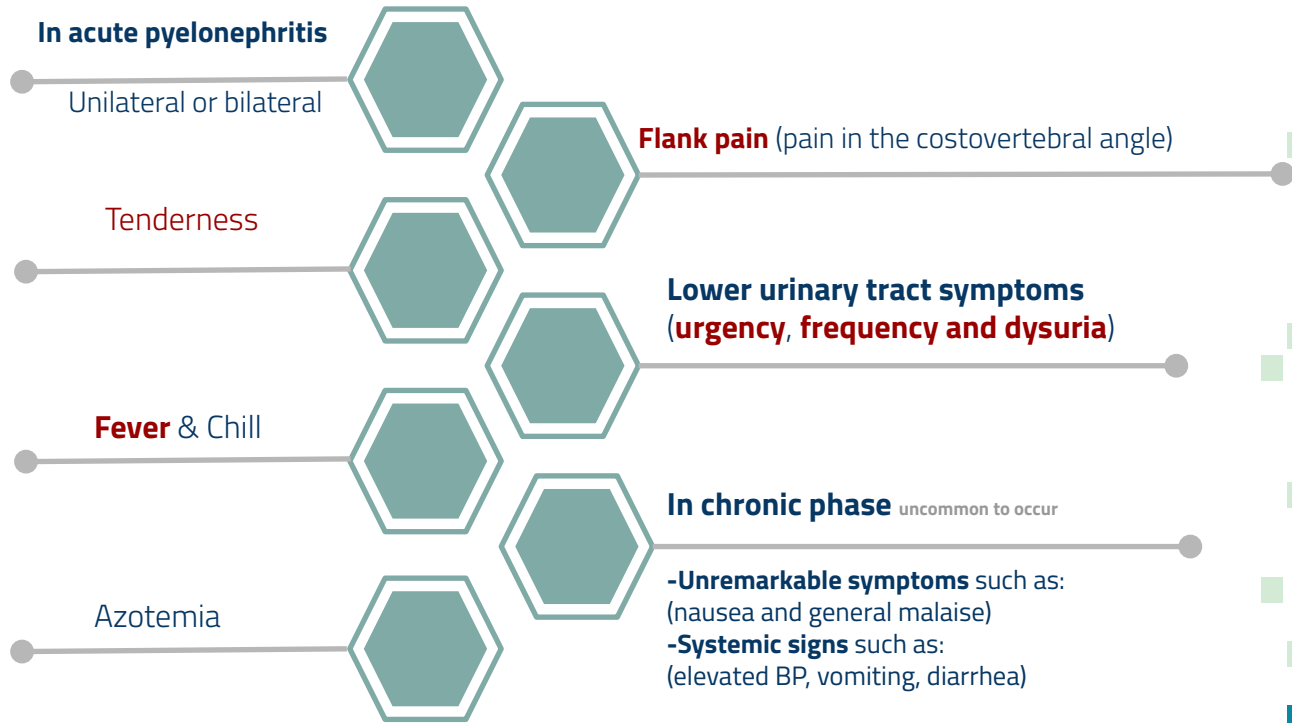


Pathology:



Signs and symptoms:

Here we can differentiate between cystitis and Pyelonephritis
-both of them has urgency, frequency and dysuria
-but here in pyelonephritis we have Flank pain and Tenderness more



Other non infectious causes of these symptoms is renal infarct and calculi

Complications:

Hypertension, septic shock, multi organs failure, death rare

Localized/generalized atrophy OR permanent loss of function

Renal or perinephric abscesses

Renal gangrene

Metastatic infection

Emphysematous pyelonephritis presence of gas within the kidney substance and in the perinephric space

Papillary necrosis

Acute renal failure

note:

Mainly complications related to the kidney and kidney injury
Potentially complications related to BP, septic shock, and spreading to other areas

Diagnosis of pyelonephritis

1

Urinalysis and microscopy: bacteria ($10^8/1$ or $10^5/ml$) and pus $\geq 10/HPF$ (90%) and leukocytes esterase, RBCs 20-40% in the urine and leukocytosis

2

A clean-catch or catheterized quantitative urine culture on BAP and selective media and sensitivity identifies the pathogen and determines appropriate antimicrobial therapy

3

-Ultrasound or CT scan
-Blood culture 15-30%
-IVP will identify the presence of obstruction or degenerative changes caused by the infection process

4

BUN and Creatinine levels of the blood and urine may be used to monitor kidney function

Management

Mild sign and symptoms	Severe cases
treated on an outpatient basis with antibiotics for 7-14 days	Hospitalization
Treatment options include: fluoroquinolone (ciprofloxacin), TMP-SMX, aminoglycoside (gentamicin) with or without ampicillin or third generation cephalosporins (ceftriaxone)	
Pipracillin/tazobactam or carbapenems in severe cases with risk of resistant bacteria	
Antibiotics are selected according to results of urinalysis culture and sensitivity and may include broad-spectrum medications	



Differential Diagnosis:

- Acute pelvic inflammatory disease
- Ectopic pregnancy
- Diverticulitis
- Renal calculi

Prevention:

- Antimicrobial prophylaxis
- TMP-SMX 3/week or **nitrofurantoin** daily
- Intravaginal estradiol
- Cranberry juice
- Removal of the urinary catheter as soon as possible or use condom catheter

Prognosis :

- 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.

SAQ

SAQ1: A pregnant woman has a 38° fever, flank pain, and high lower tract frequency. A urinalysis has been done and the results showed WBC's (50/HPF), nitrate positive, and RBC's (5/HPF) , What is the diagnosis ?what is the pathogens that may cause this disease ?

SAQ2: A 10 year old boy have admitted to the ER with fever, flank pain, vomiting and malaise. Microscopic examination showed 500 leukocytes and leukocyte esterase is positive.

What is the most likely diagnosis?What's causative agents ?duration of treatment?what is the prevention?

SAQ3: A 50 years old man with fever 38° C and flank pain and tenderness & urgency .Urine test showed nitrate and increased WBC. What is the diagnosis?what is the complication?method that use for diagnosis & the culture?what is best treatment if he was bacterial resistance?

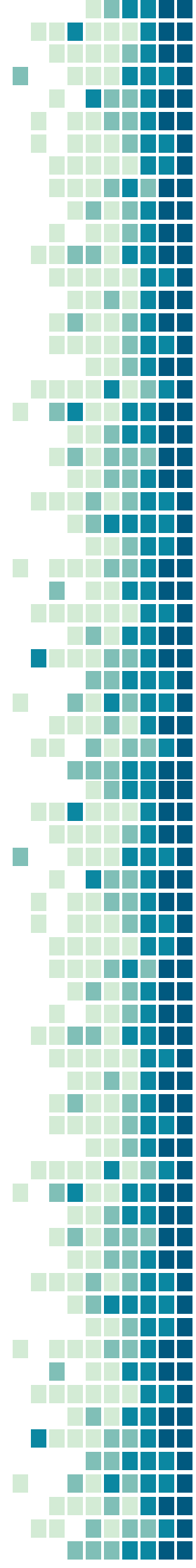
SAQ1:pyelonephritis/*Escherichia coli*,*Klebsiella pneumoniae*,*Staphylococcus aureus*

SAQ2: pyelonephritis/*E.coli*,*Proteus mirabilis*,*Enterobacter*/7- 14 days/Cranberry juice,Antimicrobial prophylaxis

SAQ3 pyelonephritis/Hypertension, septic shock, multi organs failure, death, Renal gangrene/Ultrasound or CT scan

,quantitative urine culture/*Piperacillin*,*tazobactam* or carbapenems

MCQs



Q1: A 8 year old girl diagnosed with mild pyelonephritis. What's the best treatment?

- A- Amoxicillin B- carbapenems C- Nitrofurantoin D- Cranberry juice

Q2: The most common pathogen causing pyelonephritis is?

- A- E.coli B- Staphylococcus Aureus C- Klebsiella D- candida

Q3: infections is present with flank pain and fever?

- A- cystitis B- Pyelonephritis C- Urethritis D- pyelitis

Q4: Which one of the following organisms have causes hematogenous spread to cause pyelonephritis?

- A- E.coli B- Staphylococcus aureus C- candida D-Proteus mirabilis

Q5: duration for treating Pyelonephritis ?

- A- 4 days B- 5-7 days C- 7-14 days D- 10 days

Q6: what's the risk factor of pyelonephritis ?

- A- Both B/D B- immune suppression C- obesity D- old age

Q7: most serious complication of pyelonephritis?

- A- renal gangrene B- Papillary necrosis C-Emphysematous pyelonephritis D- Hypertension

Q8: A 40 years old lady complains of recurrent dysuria and frequency & fever , they diagnose her with pyelonephritis,what's the best treatment if she has bacterial resistance?

- A- Amoxicillin B- carbapenems C- Nitrofurantoin D- Cranberry juice

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
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A	A	B	B	C	B	A	B
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Team Leaders

- Yara Alasmari
- Manee Alkhalifah

Sub Leader

Mohammed Beyari

Team Members

- Shahad Almezel
- Noura Alsalem
- Ghadah Alsuwailem
- Noura Alshathri
- Rand AlRefaei
- Muneerah Alsadhan
- Sarah Alaidaroos
- Sara AlQuwayz
- Sadeem Alhazmi
- Abdulaziz Alderaywsh
- Faisal Alomri
- Abdulaziz Alomar
- Meshal Alhamed
- Homoud Algadheb
- Abdulaziz Alsuheim

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