Cystitis

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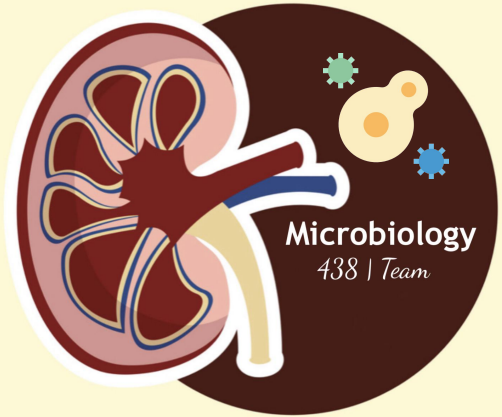


Objectives

Color index:
- Important,
- Doctor Notes
- Extra, TN

- Define the term cystitis and recall who commonly gets cystitis.
- Describe the pathogenesis and risk factors of cystitis.
- List the most common causative organisms of cystitis
- Recall the different types of cystitis (infectious and non- infectious).
- Describe the clinical presentation of cystitis
- Describe the laboratory diagnosis of cystitis
- Recall the antimicrobial agents suitable for the treatment and prevention of cystitis.

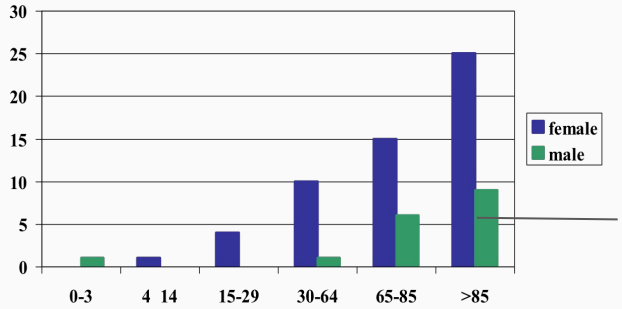
Introduction

Urinary tract infection (UTI)
Divided into:

- Lower urinary tract infection
- Upper urinary tract infection

- Patient presents with urinary symptoms and significant bacteriuria= 10^5 bacteria/ml
- Asymptomatic bacteriuria: when the patient presents with significant bacteria in urine but without symptoms
- We need to know the Count. WHY? In elderly especially in females, flora change with menopause which leads to asymptomatic bacteriuria.

→ Prevalence of Bacteriuria in different age groups



Graph Demonstrating presence of bacteria in urine more Elders.

Classification

Upper UTI

- Acute pyelonephritis
- Chronic pyelonephritis

Lower UTI

- Prostatitis and Epididymitis
- Urethritis (sexually transmitted pathogens) - urethritis in men & women
- **Cystitis** (infection of the bladder; superficial mucosal infections)

Uncomplicated UTI

- empirical therapy is possible
- Female **without** risk factors.

Complicated UTI

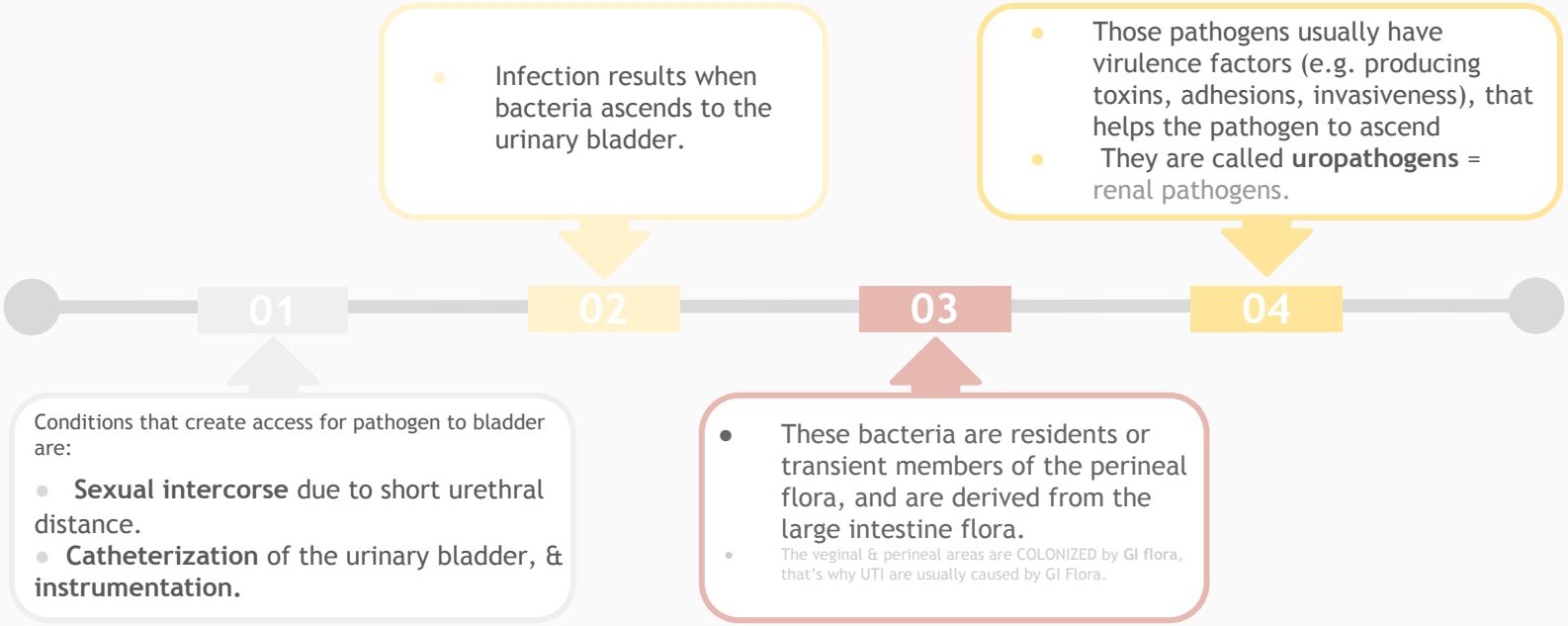
- Patient (female) **with** risk factors.
- nosocomial UTI, relapses, structural or functional abnormalities.
- Males always considered Complicated.

Pathogenesis of cystitis

- Due to frequent irritation of the mucosal surfaces of the urethra and the bladder.
- **By 2 methods:**

More common

a. Causative agent (GI flora) will **Ascends** from urethra to the urinary bladder.



Uncommon

b. **Hematogenous** through blood stream from other sites of infection (less common) mainly by Staph. aureus, blood group A and B more like to get infection

Cystitis

- **Complicated UTI (Risk factors):**
  - In women:
    - Cystitis is **common** due to a number of reasons:
      Short urethra, Pregnancy, and Decreased estrogen production during menopause.n (change in flora)
  - In men:
    - Mainly due to persistent bacterial infection of the prostate. (uncommon in men due to the long urethra)
- **Uncomplicated UTI**
  - Usually occurs in:
    - non pregnant, young sexually active females without structural or neurological abnormalities.
    - Female with NO risk factors.

Etiologic agents

01

E.coli

is the most common (90%) cause of cystitis.

It comes from the large colon

02

Other Enterobacteriaceae:

Klebsiella pneumoniae, Proteus spp

03

Other gram negative rods

eg. P.aeruginosa

Associated with recurrent infections due to structure abnormalities

04

Gram positive bacteria

Enterococcus faecalis, group B Streptococcus and Staphylococcus saprophyticus {cause **honeymoon cystitis**}.

With increase sexual activity it will cause an infection

05

Candida species

Less common, but important seen in diabetes and catheterized patients

06

Venereal diseases

(gonorrhea, Chlamydia) may present with cystitis.

07

Schistosoma haematobium in endemic areas.

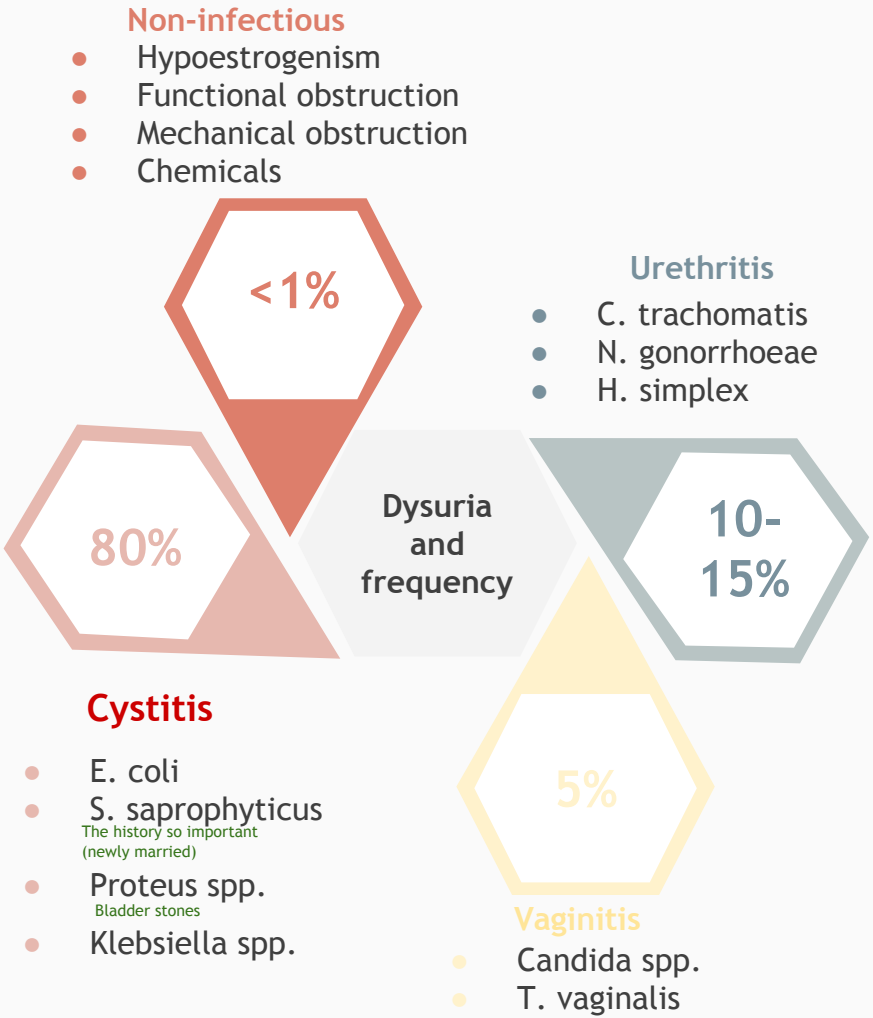
Seen in water sources. Goes to the bladder, blood can be seen. Can cause cancer if not treated

Uncomplicated UTI			Complicated UTI	Special causes
Microorganism	Stains Not useful though!	**Percentage**	percentage is not possible to judge, often multi-resistant strains.	S. epidermidis there must be a foreign body enters the body, to make an infection. Gram+ve cocci in clusters coagulase -ve
E. coli	Gram -ve bacilli, GI flora	64%		
Enterobacteriaceae	large family of Gram -ve e.g. klebsiella	16%	E. coli	S. saprophyticus Gram+ve cocci in clusters coagulase -ve Seen in uncomplicated female (newly married)
Enterococcus spp	Gram +ve cocci in chains (catalase -ve) gamma (non) hemolytic.	20%	Enterobacteriaceae	Yeasts (catheter related)
Pseudomonas spp	Gram -ve bacilli	<1%	Pseudomonas spp	Viruses (Adenovirus, Varicella)
S. aureus	^^	<1%	Acinetobacter	Chlamydia trachomatis

Clinical presentation

Symptoms usually of acute onset:

- Dysuria (painful urination)
- Frequency (frequent voiding)
- Urgency (an imperative call for toilet)
- Hematuria (blood in urine) in 50% of cases.
- Usually no fever.



How to differentiate between cystitis and urethritis ?

Cystitis	Urethritis
Not a sexually transmitted disease, but sexual intercourse does increase the risk of cystitis.	Sexually transmitted.
More acute onset	Less acute onset
Severe symptoms	Mild symptoms
Pain, tenderness on the supra-pubic area	Thin urethral discharge
Presence of bacteria in urine (bacteriuria)	Absence of bacteria in urine
Urine cloudy, malodorous and may be bloody	-

Urine sample

Differential diagnosis (types of cystitis)

→ Non-infectious cystitis such as:

01 **Traumatic cystitis**
- → in women
  After delivery

02 **Interstitial cystitis**
- → unknown cause
- → Autoimmune attack of the bladder

03 **Eosinophilic cystitis**

04 **Hemorrhagic cystitis**
- → Due to radiotherapy or chemotherapy.

Laboratory diagnosis of cystitis:

*Used if there is any recurrent infections or want to know the causative organism. If it's the first infection no need to do a culture.

01

Microscopic examination:

About 90% of patients have **> 10 WBCs /cu.mm** normal range is < 5 WBCs

- **Gram stain of uncentrifuged sample is sensitive and specific.**
- One organism per oil-immersion field is indicative of infection.
- Blood cells, parasites or crystals can be seen

03

Urine culture*:

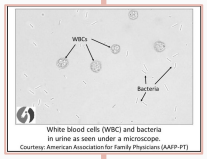
important to identify bacterial cause and antimicrobial sensitivity .

Quantitative culture typical of UTI (>100,000 cfu/ml) Lower count (<100,000 or less eg. 1000 cfu/ml) is indicative of cystitis if the patient is symptomatic.

Specimen collection:

Most important is clean catch urine [Midstream urine (MSU)**] to bypass contamination by perineal flora and must be before starting antibiotic.

- Supra-pubic aspiration or catheterization may be used in children.
- Catheter urine should not be used for diagnosis of UTI.



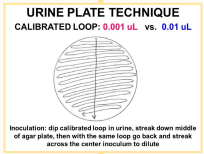
White blood cells (WBC) and bacteria in urine as seen under a microscope.
Courtesy: American Association for Family Physicians (AAFP-PT)

02

**Mid stream urine mean to instruct the patient to;
1- clean the area before urination
2- use the urine after passing the first mls
3- use sterile container
4- send it to the lab within 2 hrs
Because the first mls, may include GI flora that tries to ascend.

Chemical screening tests:

Urine dipstick –rapid, detects **nitrites** released by bacterial metabolism and **leukocyte esterase** from inflammatory cells. Not specific .



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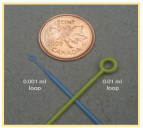
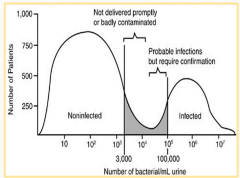


Using 0.001/ml loop
- **1 colony = 1000 CFU/ml**
- **100 colonies = 100,000 CFU/ml**

Count :
$0\text{-}10^3$ –> non-infected
$10^3\text{-}10^5$ –> maybe infected, depends on the symptoms
$> 10^5$ –> absolutely infected



Recurrent cystitis:

More in the management lecture but prophylaxis maybe used

Three or more episodes of cystitis/year:

- Requires further investigations such as Intravenous Urogram (IVU) or Ultrasound to detect obstruction or congenital deformity.
- Cystoscopy required in some cases.

An intravenous pyelogram, also called an intravenous urogram, is a radiological procedure used to visualize abnormalities of the urinary system, including the kidneys, ureters, and bladder. Unlike a kidneys, ureters, and bladder x-ray, which is a plain radiograph, an IVP uses contrast to highlight the urinary tract.

Intravenous Urogram (IVU)

Treatment:

Empiric treatment: commonly used depending on the knowledge of common organism and sensitivity pattern.

- Treatment best guided by susceptibility pattern of the causative bacteria.

Common agents:

1. Ampicillin or Amoxacillin
2. Amoxacillin-Clavulanic acid
3. Cephradine
4. Ciprofloxacin
5. Norfloxacin
6. Gentamicin or TRM-SMX.

Duration:	- **three days for uncomplicated cystitis** - 10-14 days for complicated and recurrent cystitis.
Prophylaxis:	required for recurrent cases by Nitrofurantoin or TRM-SMX.
Prevention:	drinking plenty of water and prophylactic antibiotic. The less you drink water -> less urination -> more infection

25 years old female seen in a walk in clinic with history of 2 days *urine frequency, dysuria, no flank pain or fever, examination revealed supra pubic tenderness.*

What's the diagnosis and why? Cystitis. Supra pubic tenderness, dysuria, and urine frequency. If there was fever and flank pain it would be pyelonephritis.

Specimen type? Midstream urine (MSU). If it was a child use a catheter or Supra-pubic aspiration.

What do you do with the specimen samples? Urinalysis/dipstick. Culture if there's a recurrent infection or to know the causative organism.

Common causative organism: E.coli (use this if no specific details about the organism are given), staphylococcus saprophyticus (young female, sexually active, gram positive, not seen in men or elderly), Klebsiella.

Pathogenesis: ascending from GI flora organism. Other mechanism (but doesn't apply on this case) Haematogenous.

Risk factors: diabetes, aging factors, sexual activity, functional abnormalities. (Usually the risks are given but if asked then mention any general risk factors)

- Cystitis: very common especially in **females**, out/in patients, ER
- Symptoms related to the urinary bladder pain while the pyelonephritis is related to fever and flank pain. Most causes are infectious but there are non infectious
- If the patient is female, healthy, young, first time it's uncomplicated case and we give her empiric treatment for three days and advice her for a good hydration.without doing any investigation
- Males and children are not normal to have cystitis
- Common Structure abnormalities in children that cause UTI is "vesicoureteral reflux"

Summary

From Dr. Khalifa

Most Important causes

Gram positive

- **Cocci in chains**
  - Sterptointercoccus (group B)
- **Cocci in clusters**
  - Staphylococcus
    - coagulase positive
      - Staph. aureus Comes from other infections (Hematogenous) 
    - coagulase negative
      - Staph. epidermidis
        Elderly - catheterized
      - Staph. Saprophyticus
        Young female, sexually active

Gram negative

- **Escherichia coli** 
- **P.aeruginosa**
  (seen in hospitalized patients)
- **Klebsiella**

Quiz

1- A 60-year-old woman is diagnosed with cystitis after she catheterized due to urinary incontinence, Blood culture and gram stain showed a gram +ve cocci in clusters that are coagulase -ve, Which of the following is the most likely causal agent?

A. Staph. aureus
B. Staph. epidermidis
C. Staph. Saprophyticus
D. E.coli

2- A 27 y/o woman, after returning home from her honeymoon, has developed urinary frequency, dysuria, urgency. Her urine is grossly bloody. Which lab data are most likely to define the causative agent?

A. A gram negative diplococcus, which is oxidase + but do not ferment maltose
B. an optochin resistant. catalase -, gram positive cocci
C. A gram +ve cocci ,which is catalase +ve and Coagulase -ve
D. a gram-negative bacterium capable of reducing nitrates to nitrites

3- The typical quantitative culture for UTI is?

A. 100 cfu/ml
B. <100,000 cfu/ml
C. 1,000 - 3,000 cfu/ml
D. >100,000 cfu/ml

4- Which of the following are the most commonly assessed findings in cystitis?

A. Frequency, urgency, dehydration, nausea, chills, and flank pain
B. Nocturia, frequency, urgency dysuria, hematuria and suprapubic pain
C. Dehydration, hypertension, dysuria, suprapubic pain, chills, and fever
D. High fever, chills, flank pain nausea, vomiting, dysuria, and frequency

SAQ

1- 29 years old female seen in a walk in clinic with history of 2 days urine frequency, dysuria, no flank pain or fever, examination revealed supra pubic tenderness, mention 3 risk factors.

2- 18 Year old female comes to the physician because of 1-Day history of Urgency and Dysuria, her temperature is 37.4 C,. She had appear to spent a summer In Las Vegas where She took Part in many sexual intercourses, Physician Microscopic laboratory Investigation showed, Leukocyte esterase +3 and WPCs 9,500mm.Culture showed Gram +ve, catalase +ve, coagulase -ve, resistance-novobiocin.

What is condition? What is the Causative agents?

Answers

1- Click here

2- Cystitis (Uncomplicated),
Staph. saprophyticus

Key answers:

1-B 2-C 3-D 4-B

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Thank you

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