

UTI & Anemia in Pregnancy

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References: 437 Lectures And Notes , 436 teamwork

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Objectives:

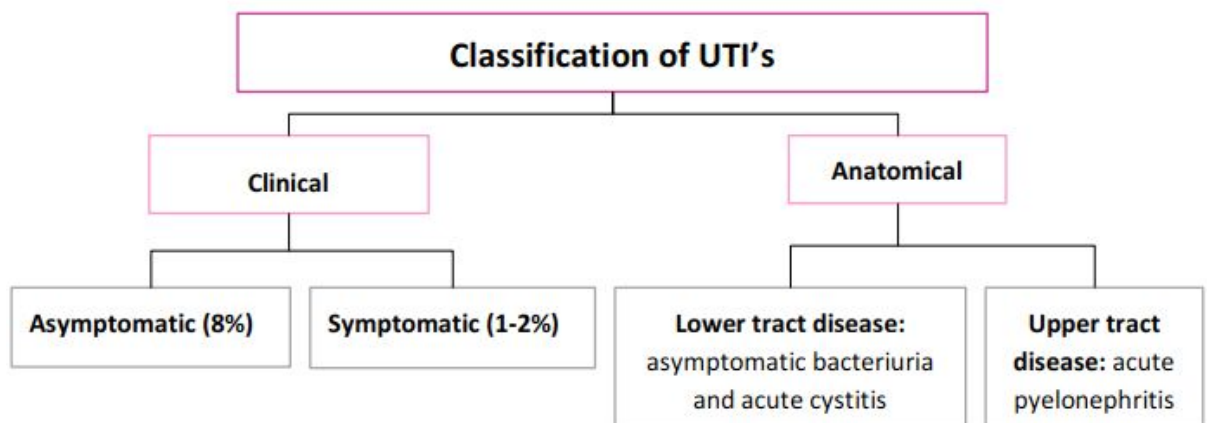
1. Define symptomatic UTI and asymptomatic bacteriuria in pregnancy.
2. Describe the incidence, causes and epidemiology of urinary tract infection (UTI) including pyelonephritis and asymptomatic bacteria in pregnancy.
3. Describe a diagnostic approach to a patient presenting with UTI.
4. Outline the plan of management for UTI in pregnancy.
5. Describe the Impact and complications of UTI on pregnancy and on maternal health.

Urinary Tract Infections in Pregnancy

- Common medical complication of pregnancy (2-10%). 2nd most common infection. **After upper respiratory tract infections.**
- Pathophysiology: ascending bacteria from vagina and rectum. **Urinary tract in general is a sterile environment, thus urine is always sterile even though it carries waste products.**
- Most common causative organisms: gram -ve enteric bacteria **bowel bacteria.** (e.g: E.Coli 60-80% "**most common**", Proteus, K. Pneumoniae, Pseudomonas (**not normal flora**), and GBS (**vaginal normal flora**) group B strep. Is very common).
- Fungi (**candida**) may cause UTI but it's not common.
- Lactobacilli causes no UTI because it's normal flora of the vagina thus it's non pathogenic. It protects the vagina from opportunistic bacteria and secretes acidic discharge which is protective.

Urinary Tract Infections (terminology)

- Bacteriuria: Bacteria in the urine Urine is sterile fluid and shouldn't have bacteria , but contamination might happen . That is why when we collect a specimen we use 1)aseptic technique 2)mid stream urine. **It may present without symptoms and is called asymptomatic bacteriuria or with symptoms as cystitis or pyelonephritis.**
- **Significant bacteriuria** : = or $> 10^5$ CFU/mL of urine. **When significant bacteriuria is present pt. May start developing symptoms.**
- Asymptomatic subclinical bacteriuria.**much more common in pregnancy.**
- Lower UTI /cystitis. **Can be acute or chronic.**
- Upper UTI / pyelonephritis. **Kidney involvement.**



Changes in Pregnancy causing urinary stasis

- Kidneys: ↑ in length, weight, and pelvis size (physiologic hydronephrosis).
Rt > Lt because of pressure from the gravid uterus. rt. side is always affected more because the uterus is a little bit tilted to the right → dilated of the ureter → give us a reflux → Mild hydronephrosis in pregnancy is considered a physiological change, it does not indicate any pathology.
- Ureters: dilated or hydroureter (Rt > Lt), urinary stasis.
- Mechanism: hormonal (progesterone is a smooth muscle relaxant, it's increase during pregnancy will affect the ureters so it doesn't drain as much) or mechanical pressure from the gravid uterus on the ureter and both causes stasis → UTI.
- Consequences: risk of urinary tract infections.
- We usually advise pregnant women to **avoid** sleeping on their **rt. Side**, because it may compress the IVC; especially after 20wk of gestation. This compression will result in hypotension, palpitation and decreased in cardiac output due to decrease in the pre load.

Risk Factors for UTI's in Pregnancy

- Female Gender.
- Mechanical obstruction: ureteropelvic junction, urethral or ureteric stenosis, & calculi.
- Functional obstruction: pregnancy & vesicoureteral reflux.
- Others: Systemic diseases: DM very common (sugar is a very attractive environment for bacteria to grow in. Uncontrolled DM will cause glucosuria that will eventually attract bacteria), sickle cell trait/disease (because of the excretion of heme in urine. This is almost like a blood agar that will also attract bacteria), gout, cystic renal disease (any kind of renal diseases).

Types of UTI Recurrences

1. Relapse: same organism within 2-3 wks, 2ndry to perineal colonization or inadequate Rx. Wrong or ineffective treatment. Ongoing infection that is not treated properly or not responding to treatment.
2. Reinfection: 2ndry to recurrent new organism within 12 wk. bladder bacteriuria. It is an infection that went away and now pt. Is experiencing a 2nd wave.
3. Superinfection: new organism while on Rx. Immunocompromised pt. When being treated with antibiotics then they get superimposed fungal infection. It is a new organism that took the chance of compromised immunity. the 1st organism will cause the damage and the 2nd organism will become more active.

4. Recurrent UTI (chronic): 2 different infections in 6 months or = >3 in 1 year. should be documented by culture and should be shown that they are infection separate from each other. If she is known to have recurrent UTI before pregnancy we have to put her on a prophylaxis course (nitrofurantoin or low dose of cephalosporin).

	Asymptomatic Bacteriuria (ABU) treated only in pregnancy	Acute Cystitis	Acute Pyelonephritis
Incidence in pregnancy	<ul style="list-style-type: none"> 2-10% in pregnancy, similar to sexually active women. most common UTI in pregnancy. 	<ul style="list-style-type: none"> 1-2% 	<ul style="list-style-type: none"> involving the upper urinary tract. (Seen more in women with ureteric stones bc more stasis, hydronephrosis and bacteria use stones as a base). 2-4%, Most commonly in the second trimester. one of the most common serious medical complications of resistance to it). Try to give medications that are taken once or twice a day for compliance issues. Don't use I.V meds. In this case only oral. You have to be careful with meds. As some are not safe.pregnancy.
Consequences	Acute pyelonephritis (30%). If not treated.		<ul style="list-style-type: none"> sepsis, adult respiratory distress syndrome (ARDS), anemia, renal failure, preterm labor. The leading cause of ARDS and septic shock in pregnancy.
Clinical presentation	No symptoms, you discover it through antenatal screening by: 1- urine dipstick (not used any more). 2- urinalysis (best way).	Urgency, frequency (day time), dysuria, suprabubic pain, hematuria and nocturia. No systemic findings.	Lower & Upper UTI + systemic: Urgency, frequency, and burning, flank pain, fever/chills, tachycardia, CVA tenderness (R>L), nausea and vomiting. "systemic"
Diagnosis	<ul style="list-style-type: none"> Dipstick Urinalysis Culture and sensitivity 		Signs & Symptoms, Leukocytosis, Urine culture, Blood culture +ve in 10%.



<p>Management:</p>	<p>Outpatient Abx for 3-10 days or just 3-5 days.</p>	<p>1- outpatient Abx (2nd generation cephalosporin or nitrofurantoin) & analgesics such as acetaminophen won't really help because the problem is in the detrosal muscle of the bladder (it will relax the bladder). For 7-10 days. 2- Re culture (after 1-2wk from completing the treatment).</p>	<p>- Inpatient - Admissions. - Generous IV hydration, Antipyretic agents, Abx for 10-14 days (parenteral abx). - Re culture, because it's 10-25% recurrent after 1 week to 10 days.</p>
<p>Abx.</p>	<ul style="list-style-type: none"> • Nitrofurantoin best Abx. twice a day. • Amoxil (amoxicillin): 1st generation cephalosporin. (Because of abuse, 60-70% of enteric bacteria are now resistant to it) • Try to give medications that are taken once or twice a day for compliance issues. • Don't use I.V meds. In this case only oral. • You have to be careful with meds. As some are not safe. 	<ul style="list-style-type: none"> • ampicillin for gram +ve or cephalosporin for gram +ve and -ve then p.o • gentamicin for gram -ve and metronidazole for Anaerobic . • we can give triple Ab regimen to cover all organisms • We give IV treatment till the fever subsides for 24 hrs then we shift to oral. • the best way to treat fever of unknown origin we give broad spectrum Ab. 	

- We do routine tests in every visit to look for ? 1) Protein. 2) Glucose. 3) Bacteria in urine bc UTI can induce labour.
- Different conditions affecting the urinary tract will cause similar symptoms. Make sure your diagnosis is right by investigating.

Prevention

- Prenatal screening for ASB Asymptomatic bacteriuria in pregnant women try to do urine analysis every visit.

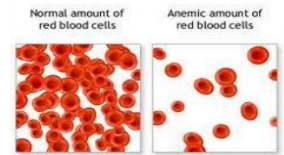
- Hygiene.
- Increase intake of water if she doesn't drink enough water the urine conc. Will be high and she won't feel the urge of urinating > increase stasis > increase UTI.
- Consumption of Cranberry products theories say that cranberry increases the acidity and kills bacteria.
- We can also give them lactobacilli.

Anemia in pregnancy

- It's a global health problem.
- **Commonest medical disorder in pregnancy.**
- Prevalence varies from population to another (e.g: in India between 50-70% while in USA is 2-4%).
- Nutritional anemia (iron deficiency) is commonest. **Other types of nutritional anemia include folic acid and B12.**
- It is an important contributor to maternal & perinatal morbidity & mortality as a direct or indirect cause.

Definition - Anemia Anemia will cause more bleeding, more bleeding will cause more anemia

A condition where circulating levels of Hb are quantitatively or qualitatively lower than normal (Anemia is a hemoglobin concentration <10 g/dL during pregnancy or the puerperium. This is less than the 12 g/dL that is the lower limit of normal in the nonpregnant woman).



	Nonpregnant female	Pregnant woman	Pregnant woman	
			1 st and 2 nd trimester	3 rd trimester
Hemoglobin (whole blood)	< 12gm%	< 11gm% (cut off point in pregnancy) hct : < 33%	< 11 gm%	< 10.5gm%

Anemia Severity Classification

	Mild	Moderate	Severe	Very Severe
Hb values	10.0-10.9 gm%	7-9.9	<7 body adapt	<4 acute bleeding

Pathophysiology of Anemia in Pregnancy

- Blood volume (plasma) increases 40-45% in pregnancy (between 10 to 24 weeks).
- Increase in plasma is more as compared to red cell mass leading to hemodilution & decrease in Hemoglobin level. We accept a lower cut off point because of this physiological change.
- Red cell mass (driven by an increase in maternal erythropoietin production) also slightly increases.
- Hematocrit decreases from between 38% - 45% in healthy non-pregnant women to about 34% during late single pregnancy and to 30% during late multifetal pregnancy.
- Iron stores are depleted with each pregnancy. Why? The baby needs to build Hb and RBC, so they will share the mother's iron store.
- Falling hemoglobin values do not occur until complete depletion of iron stores in the liver, spleen, and bone marrow, which is followed by a decrease in serum iron with increase in total iron binding capacity (TIBC).
- Too soon & too many pregnancies result in higher prevalence of iron deficiency anemia.
- Women who take iron supplements have less pronounced changes in hemoglobin, as they increase their red cell mass in a more proportionate manner than those not on hematinic supplements.

Causes of Anemia in Pregnancy

Most Common Causes: which are commonly due to nutritional factors

1. Iron deficiency.
2. Folate deficiency. (folic acid)
3. Vitamin B12 deficiency.
4. Hemoglobinopathies. (Thalassemia and sickle cell anemia)

Symptoms of anemia during pregnancy

These symptoms can also be purely due to physiological changes.

- Weakness or fatigue.
- Dizziness.
- Shortness of breath.
- Rapid or irregular heartbeat. (Palpitations)
- Chest Pain.
- Pale skin, lips, and nails.
- Cold hands and feet. (common)
- Trouble concentrating. (Sleeping problems)



Most Critical Period **mother must have good Hb level during:**

- 28-30 weeks of pregnancy because you have to correct it before she reaches the time of delivery bc we don't need her to go to severe bleeding and need blood transfusion.
- In labor.
- Immediately after delivery.
- Early Puerperium.
- CHF (Failure to cope up with pregnancy induced cardiac load).

Investigation

CBC every trimester (3 months) or every 2 months.

- Severity of anemia – Hb & Haematocrit, at first visit, 28-30wk & 36wk.
- Type of anemia – GBP microcytic, macrocytic, dimorphic, normocytic, hemolytic, pancytopenia.
- Bone marrow activity – reticulocyte count (N .2-2%), higher bone marrow activity is seen in: hemolytic anemia, following acute blood loss, iron def anemia on treatment.
- Cause of anemia – by various investigations.

Special Investigations **No need to memorize the values**

- **Serum Ferritin** – abnormal if < 20 ng/ml (N 40-160 ng/dl), assess iron stores
- **Serum Iron** – N 65-165 ug/dl, **decreases** in Fe def anemia
- **Serum Iron binding capacity** – 300-360 ug/dl, **increases** with severity of anemia
- Percentage saturation of transferrin – 35-50%, decreases to less than 20% in fe def anemia
- RBC Protoporphyrin – 30ug/dl, it doubles or triples in Fe def anemia (substrate to bind with Fe, cannot be converted into Hb in Fe def)
- **When someone has anemia but there's no evidence of nutritional anemia, then think of hemoglobinopathies, and ask for plasma electrophoresis to look into different kinds of hemoglobin.**

Effect of Anemia on Pregnancy & Mother in severe anemia mainly

- Higher incidence of pregnancy complications:
 - PET (pre-eclamptic toxemia), abruptio placentae, preterm labor.
- Predisposed to infections like – UTI, puerperal sepsis.
- Increased risk to PPH (Primary postpartum haemorrhage).
- Subinvolution of the uterus **may prevent the uterus from coming back to its normal shape.**
- Lactation failure.
- Maternal mortality – due to:
 - CHF
 - Cerebral anoxia (bc of decrease O₂ delivery)
 - Sepsis
 - Thrombo-embolism

Effect of Anemia on Fetus & Neonate

- Higher incidence of abortions, preterm birth, Intrauterine growth restriction (IUGR) due to malnutrition.
- Intrauterine fetal death (IUFD).
- Low APGAR (Apgar score) at birth. **high risk of cognitive and affective dysfunction**
- Neonate is more susceptible for anemia & Infections sickle cell anemia.
- Higher Perinatal morbidity & mortality.
- Anemic infant with cognitive & affective dysfunction.

Pharmaco-kinetics of Iron / daily requirement

- Normal diet contains about 14 mg of iron.
- Absorption of iron is 5-10% (1-2mg) & 3-4% in pure veg diet.
- Additional daily iron demand in early pregnancy 2-3 mg/day.
- In late pregnancy 6-7 mg/day.
- So daily supplement of 40-60 mg of elemental iron is required during pregnancy.
- Folic acid requirement is also increased 400-600 ug/day.
- **In strict veg Vit B 12 is also deficient.**

- Know what type of iron we give and how many mg. We don't give elemental iron but we have equivalents for it.
- As mentioned we have to give 30-60 mg of elemental iron.
- Every pregnant woman needs additional iron supplement

World Health Organization	
e-Library of Evidence for Nutrition Actions (eLENA)	
Daily iron and folic acid supplementation during pregnancy	
Guidance summary*	
WHO recommendations	
Daily oral iron and folic acid supplementation is recommended as part of the antenatal care to reduce the risk of low birth weight, maternal anaemia and iron deficiency.	
Suggested scheme for daily iron and folic acid supplementation in pregnant women	
Target group	Pregnant women
Dose	Iron: 30-60 mg of elemental iron ^a Folic acid: 400 ug (0.4 mg)
Frequency	One supplement daily
Duration	Throughout pregnancy. Iron and folic acid supplementation should begin as early as possible
Target group	All pregnant adolescents and adult women
Settings	All settings
<small>a. 30 mg of elemental iron equals 150 mg of ferrous sulfate heptahydrate, 90 mg of ferrous fumarate or 250 mg of ferrous gluconate.</small>	
Remarks	
* In settings where anaemia in pregnant women is a severe public health problem (50% of higher), a daily dose of 60 mg of elemental iron is preferred over a lower dose.	

Iron deficiency anemia

- CBC, MCV value (MCV is low) **microcytic**
- Measurement of serum iron, ferritin, and transferrin
- **Decreased serum iron and ferritin and increased serum transferrin levels confirm the diagnosis.**
- Usually ferrous sulfate 325 mg orally once/day
- Parenteral therapy **if she is near to term¹**
 - IM: 20% of pregnant women do not absorb enough supplemental oral iron or non-compliance (**rarely used**)
 - IV: faster increases in Hb and better replenishment of iron stores in comparison with oral therapy (**if the Hb is very low and the lady is near term**)
- Iron deficiency anemia is the most common anemia in women because of menstrual and pregnancy needs.

¹ "If she less than 30 weeks we give tablet, if more 30 weeks parenteral

Differentiation between iron deficiency anemia & Thalassemia (just know the red ones)

Investigations	Normal values	Fe Def Anemia	Thalassemia
MCV	75-96 fl	reduced V	reduced
MCH	27-33pg	reduced V	reduced
MCHC	32-35 gm/dl	reduced	N or reduced
HbF	<2 %	normal	Raised
HbA2	2-3%	N or reduced	Raised >3.5%
Serum Iron	60-120 ug/dl	reduced	Normal
Serum Ferritin	15-300 ug/L	reduced	Normal
TIBC	300-350	Raised	Normal
Bone iron stores		reduced	Normal
Free erythrocyte protoporphyrin (FEP)	<35 ug/dl	>50	Normal

Treatment for Iron Deficiency Anemia

- Improving diet rich in iron & fruits & leafy vegetables.
- Treat worm infections.
- Food fortification with iron.
- **Iron & folic acid supplementation** during pregnancy (folic acid must be taken 2 months before pregnancy and the first 2 months of pregnancy).
- Heme iron better, present in animal food **meat** & is better absorbed.
- Iron absorption enhanced by citrus fruits, Vit C.
- Avoid tea, coffee, Ca, phytates, phosphates, oxalates.

Folate deficiency (Megaloblastic Macrocytic Anemia)

- Risk factors include chronic hemolytic anemias (e.g., sickle cell disease), anticonvulsant use (phenytoin, phenobarbital), and frequent pregnancies.
- Fetal effects include increased IUGR, preterm birth, and neural tube defects.
- Deficiency occurs in 0.5 to 1.5% of pregnant women.
- Diagnosis Measurement of serum folate.
- Severe megaloblastic anemia may warrant bone marrow examination and further treatment in a hospital.
- Treatment is folate 1 mg po bid.
- Prevention includes folate 0.4 mg po daily for all women and 4 mg po daily for those at high risk for NTDs (previous baby with NTD, family hx of NTD, DM TYPE 1/2, seizure disorders).

Indications for Blood Transfusion

- Severe anemia first seen after 36 weeks of pregnancy.
- Anemia due to acute blood Loss – APH & PPH.
- Associated Infection.
- Patient not responding to oral or parenteral therapy.
- Anemic & symptomatic pregnant women (dyspneic, with heart failure etc) irrespective of gestational age.
- We do it in abortion where decrease in Hb happens.

Sickle cell anemia

- inherited autosomal recessive disease.
- **African and Mediterranean** descent is the only significant risk factor for sickle cell anemia.
- Diagnostic test: hemoglobin electrophoresis.
- **Effects on pregnancy with:**
- Trait: may include increased urinary tract infection but unchanged pregnancy outcome.
- Sickle disease: possible increased spontaneous abortions, IUGR, fetal deaths, and preterm delivery.
- Treatment: Avoid hypoxia, take folate supplements, and monitor fetus.

Summary

Urinary Tract Infections: (the 2nd most common pregnancy problem)

organism	<ul style="list-style-type: none"> ● Most common causative organisms: ● gram (– ve) enteric bacteria e.g: E.Coli 60-80%, Proteus, K. Pneumoniae, Pseudomonas...2. GBS
Causes	<ol style="list-style-type: none"> 1. FEMALE GENDER: Lifetime risk is 50% 2. Anatomic Changes in Pregnancy.
Risk Factors	<ol style="list-style-type: none"> 1. Mechanical obstruction. 2. Functional obstruction. 3. Systemic diseases like DM, sickle cell trait/disease, gout, cystic renal disease
Prevention	<ol style="list-style-type: none"> 1. Prenatal screening for asymptomatic bacteriuria in pregnant women. 2. Hygiene.

Types of infection

Asymptomatic Bacteriuria	<ul style="list-style-type: none"> ● Most common ● Cause acute pyelonephritis ● Management : outpatient Abx for 3-10 days EVEN 6 ASYMPTOMATIC PREGNANT WOMEN YOU HAVE TO TREAT THEM (because pregnant women are considered immunocompromised)
Acute Cystitis	<ul style="list-style-type: none"> ● Cause acute pyelonephritis ● Management :outpatient Abx & analgesics for 7-10 days
Acute Pyelonephritis	<ul style="list-style-type: none"> ● The leading cause of ARDS and septic shock in pregnancy ● management: - Generous IV hydration, Antipyretic agents, Abx for 10-14 days - Re culture, because it's 10-25% recurrent Risk of recurrence is so high

Anemia in Pregnancy

Iron deficiency anemia	<ul style="list-style-type: none"> ● Often asymptomatic. Diagnosed in routine screening (routine screening at the beginning of the pregnancy is a cheap and simple way to detect it early) but, tiredness, dizziness, fainting, pallor may be apparent ● Pathophysiology: Increase demand in pregnancy due to expanding red cell mass and fetal requirement ● Treatment: ferrous sulfate, Parenteral therapy, IM
Folate deficiency	<ul style="list-style-type: none"> ● Folate deficiency (Megaloblastic Macrocytic Anemia) increases risk of neural tube ● Treatment: folate 1 mg po bid

MCQs

1- Q1: Your 25-years old patient is pregnant at 36 weeks gestation. She has an acute urinary tract infection (UTI). Of the following medications used in the treatment of UTIs, which is contraindicated?

- a . Ampicillin
- b. Nitrofurantoin
- c. Trimethoprim/sulfamethoxazole
- d. Cephalexin e. Amoxicillin/clavulanate

Q2: A pregnant woman with iron deficiency anemia at 20 weeks of gestation. Her Hb is 9 mg/dL and she is not on any treatment, what is the best management for her?

- A- IV iron as inpatient treatment
- B- Blood transfusion C- Oral iron and folic acid
- D- Immediate delivery to avoid further drop in hemoglobin

Q3: All the following are true about acute pyelonephritis except:

- a. Occurs in 60% of pregnant patients.
- b. Can be preceded by asymptomatic bacteriuria
- c. Treated by I.V. antibiotics.
- d. When recurrent, should be investigated e. May lead to premature labour

Q4: a 36 year old G3, P2 presents for her first prenatal visit. Urinalysis shows bacteria 100000 CFU/ml. She has no symptoms. What is the management?

- a. Encourage to take plenty of water
- b. Reassurance and ask patient to report symptoms.
- c. Reassurance and report urine culture next visit.
- d. Treatment with oral antibiotics

Answers: 1) c 2) c 3) a 4) d