

UTI & Anemia in Pregnancy

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References: 436 doctor's slides and notes , 435 teamwork

Color code: Notes | Important | Extra | Kaplan

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Objectives:

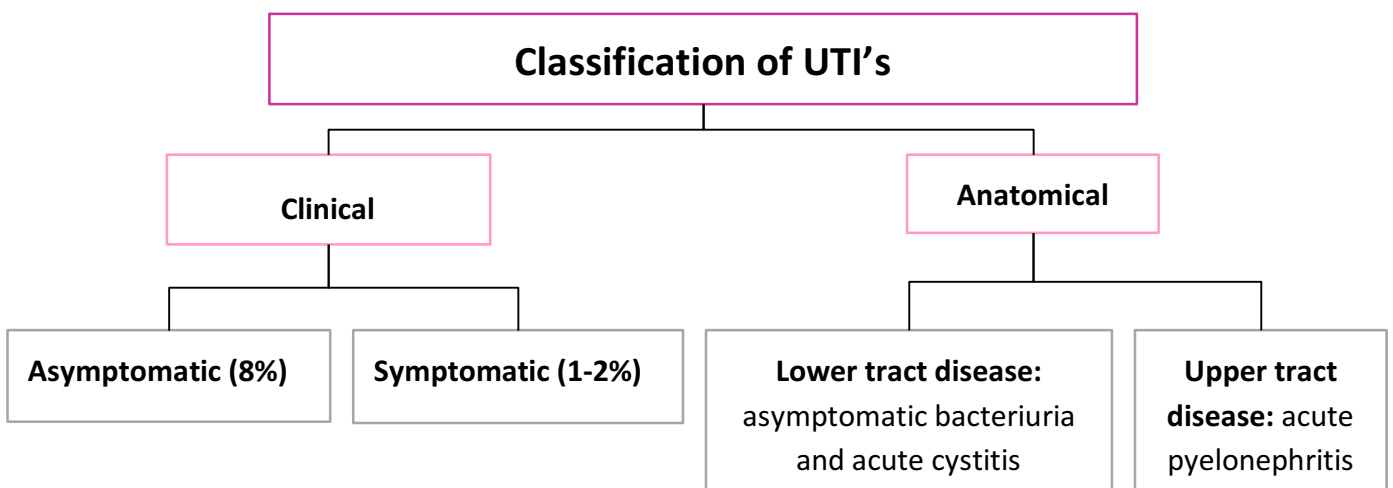
1. Define symptomatic UTI and asymptomatic bacteriuria in pregnancy.
2. Describe the incidence, causes and epidemiology of urinary tract infection (UTI) including pyelonephritis and asymptomatic bacteria in pregnancy.
3. Describe a diagnostic approach to a patient presenting with UTI.
4. Outline the 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
- Pathphysiology: ascending bacteria from vagina and rectum
- Most common causative organisms: gram –ve enteric bacteria (e.g: E.Coli 60-80% “most common”, Proteus, K.Pneumoniae, Pseudomonas, and GBS group B strep. Is very common)
- Fungi may cause UTI but it’s not common
- Lactobacilli cause 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
- Significant bacteriuria : = or > 105 CFU/mL of urine
- Asymptomatic subclinical bacteriuria
- Lower UTI /cystitis
- Upper UTI / pyelonephritis



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
- Ureters: dilated or hydroureter (Rt > Lt), urinary stasis
- Mechanism: hormonal progesterone is smooth muscle relaxant and causes relaxation in the muscles of the ureter or mechanical pressure from the gravid uterus on the ureter and both causes stasis > UTI
- Consequences: risk of urinary tract infections

Risk Factors for UTI's in Pregnancy

1. Female Gender
2. Mechanical obstruction: ureteropelvic junction, urethral or ureteric stenosis, & calculi
3. Functional obstruction: pregnancy & vesicoureteral reflux
4. Others: Systemic diseases: DM very common, sickle cell trait/disease, gout, cystic renal disease

Types of UTI Recurrences

1. Relapse:same organism within 2-3 wks,2ndry to perineal colonization or inadequate Rx wrong or ineffective treatment
2. Reinfection:2ndry to recurrent new organism within 12 wks bladder bacteriuria
3. Superinfection: new organism while on Rx immunocompromised pts. When being treated with antibiotics then they get superimposed fungal infection
4. Recurrent UTI chronic: 2 in 6months or = >3 in 1year if she is known to have recurrent UTI before pregnancy we have to put her on a prophylaxis course

	Asymptomatic Bacteriuria (ABU) we treat 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. 	1-2%	<ul style="list-style-type: none"> involving the upper urinary tract. 2-4%, Most commonly in the second trimester. one of the most common serious medical complications of 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	They have no symptoms , you discover it through antenatal screening	Urgency frequency Dysuria suprabubic pain Hematuria 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 		Signs & Symptoms, Leukocytosis, Urine culture, Blood culture +ve in 10%
Management:	outpatient Abx for 3-10 days or just 3-5 days.	1- outpatient Abx & analgesics such as acetaminophen won't really help because the problem is in the detrosal ,muscle of the bladder for 7-10 days 2- Re culture	- 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

Abx.	<ul style="list-style-type: none"> • Nitrofurantoin best Ab . twice a day • Amoxil (amoxicillin): 1st generation cephalosporin • 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. • best way to treat fever of unknown origin we give broad spectrum Ab.
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we do routine test in every visit to look for ? 1) Protein. 2) glucose. 3) Bacteria in urine.

Prevention

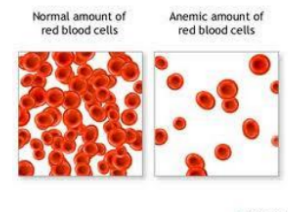
- Prenatal screening for ASB Asymptomatic bacteriuria in pregnant women try to do urine analysis every visit
- Hygiene
- Increase intake of water if she doesn't drink enough water the urine conc. Will be high and she won't feel the urge of urinating > increase stasis > increase UTI
- Consumption of Cranberry 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
- It is an important contributor to maternal & perinatal morbidity & mortality as a direct or indirect cause

Definition - 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% 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	<4 acute bleeding

Pathophysiology of Anemia in Pregnancy

- Blood volume 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
- 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
- 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
3. Vitamin B12 deficiency
4. Hemoglobinopathies

Symptoms of anemia during pregnancy

- Weakness or fatigue
- Dizziness
- Shortness of breath
- Rapid or irregular heartbeat
- Chest Pain
- Pale skin, lips, and nails
- Cold hands and feet
- Trouble concentrating

Most Critical Period

- 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 sever bleeding and need blood transfusion
- In labor
- Immediately after delivery
- Early Puerperium
- CHF (Failure to cope up with pregnancy induced cardiac load)

Investigation

- Severity of anemia – Hb & Haematocrit, at first visit, 28-30 weeks & 36 weeks
- 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

- 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)

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 uterus it 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, IUGR due to malnutrition
- IUFD
- Low APGAR (Apgar score) at birth
- Neonate 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* Folic acid: 400 µg (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

* 30 mg of elemental iron equals 150 mg of ferrous sulfate heptahydrate, 90 mg of ferrous fumarate or 250 mg of ferrous gluconate.

Remarks
- In settings where anaemia in pregnant women is a severe public health problem (40% or higher), a daily dose of 60 mg of elemental iron is preferred over a lower dose.

Extra Iron Requirement & Loss During Pregnancy

Due to cessation of menses & contraction of blood volume after delivery conservation of iron is around 400 mg

During pregnancy Total 800-1000 mg extra iron is required

300 mg for Fetus & 50 mg for Placenta	400-500 mg For increased red cell mass	250 mg iron lost during delivery 220 mg basal losses
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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)

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

- Iron deficiency anemia is the most common anemia in women because of menstrual and pregnancy needs.

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 citrous 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