437 Team: Obstetrics and Gynecology

Pre-eclampsia/Eclampsia /Gestational Hypertension

Objectives:

- Define the types of hypertension in pregnancy
- Describe the pathophysiology of preeclampsia-eclampsia
- List risk factors for preeclampsia
- Recognize the signs and symptoms to diagnose preeclampsia-eclampsia
- Explain the management of a patient with preeclampsia-eclampsia
- List the maternal and fetal complications associated with preeclampsia-eclampsia

References:

- Kaplan USMLE step 2 CK - Obstetrics and Gynecology
- Online Meded videos
- Team 435

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Color index: Important | Notes | Meded | Video-Case

Editing file link

1-Gestational Hypertension

Definition:

- Gestational hypertension is diagnosed with **sustained** elevation of BP ≥140/90 mm Hg **after 20 weeks** of pregnancy **without** proteinuria. BP returns to normal baseline postpartum.
- No symptoms of preeclampsia are seen, e.g., headache, epigastric pain, visual disturbances.
- Physical findings are unremarkable for pregnancy.
- **Lab tests are unremarkable for pregnancy.**
- Proteinuria is absent. Both proteinuria and end-organ damage are absent.
- Preeclampsia should always be ruled out.

Diagnosis:

- is made with sustained elevation of BP >140/90 mm Hg **without proteinuria** (key finding). To diagnose you need to have 2 readings.

Management:

- Conservative outpatient management with close observation since 30% of patients will develop preeclampsia. (usually resolves by 12 weeks postpartum)
- Appropriate lab testing should be performed to rule out preeclampsia, e.g., urine protein, hemoconcentration assessment.
- More frequent assessments and follow ups, more frequent urine analysis and US assessing for intrauterine growth restriction
- Deliver at 37 weeks.

OB TRIAD:
Gestational Hypertension
- Pregnancy >20 wk
- Sustained HTN
- No proteinuria

2-Preeclampsia

Definition:

- Preeclampsia is **sustained BP** elevation in pregnancy after **20 weeks'** gestation in the absence of preexisting hypertension.
- When preeclampsia arises in the **early second trimester (14 to 20 weeks)**, a **hydatidiform mole** or **choriocarcinoma** should be considered.

Pathophysiology:

- Pathophysiology involves **diffuse vasospasm** caused by:
  1. loss of the normal pregnancy-related refractoriness to vasoactive substances such as angiotensin
  2. relative or absolute changes in the following **prostaglandin** substances:
     - Increases in the vasoconstrictor thromboxane
     - Decreases in the potent vasodilator **prostacyclin**

Vasoconstriction increase systemic vascular resistance which in turn increase blood pressure.
The problem is we have vasoconstriction everywhere, it will impact organs including brain and baby

This vasospasm contributes to intravascular volume constriction and decreased perfusion of most organs including uteroplacental unit, kidneys, liver, brain, and heart. Decreased renal blood flow leads to decreased clearance of body metabolic wastes. Capillary injury leads to loss of intravascular volume into the interstitial space and subsequent edema.

Signs & Symptoms:

In preeclampsia without severe features, the symptoms and physical findings (if present) are generally related to:

- excess weight gain Gaining a 5 pounds in one week is alarming
- fluid retention

The presence of any of the following would move the diagnosis from preeclampsia without severe features to preeclampsia with severe features:

- new onset of persistent headache (decrease blood flow to the brain)
- visual disturbances
- epigastric pain or right upper quadrant abdominal pain Can present with subcapsular hematoma as hepatic complication. (stretch of gleason capsule around the liver)
- Clonus

Differential Diagnosis: Chronic hypertension should always be ruled out.

Diagnosis:

Diagnosis is made with the **diagnostic dyad**, as there are no pathognomic tests:

- **Sustained BP elevation** of ≥140/90 mm Hg
- **Proteinuria** of ≥300 mg on a 24 h urine collection or protein/creatinine ratio of ≥0.3

Risk Factors:

- Preeclampsia is 8 times more frequently in **primiparas**
- History of preeclampsia in previous pregnancies.
- Preeclampsia in a first degree relative
- Multiple gestation
- Hydatidiform mole
- Age extremes (>40)
- Maternal past medical history (**Hypertension** , **Renal disease** ,**DM** , Hypercoagulability , SLE)

Management:

- **The only definitive cure is delivery** and removal of all fetal-placental tissue. However, delivery may be deferred in preeclampsia without severe features to minimize neonatal complications of prematurity. **Management is based on gestational age.**
  - at **≥37 weeks**' gestation, **delivery** is indicated with dilute IV oxytocin induction of labor.
- **Conservative management.** Before 37 weeks' gestation as long as mother and fetus are stable, mild preeclampsia is managed in the hospital or as outpatient, watching for possible progression to severe preeclampsia. No antihypertensive agents or MgSO4 are used. Control HTN and small dose IM steroids, mainly to promote lung maturity, prevent ICH in neonate, necrotizing enterocolitis and decrease neonatal death.

Complications:

Maternal complication:

- Eclampsia: .seizures before, during or after delivery: Give IV magnesium sulfate
- HELLP Syndrome.
- Stroke.
- Liver damage.
- Kidney injury.

Fetal complication:

- Preterm delivery
- Placental abruption
- Fetal growth restriction
- Fetal death.

OB TRIAD

Preeclampsia

- Pregnancy >20 wk
- Sustained HTN (>140/90 mm Hg)
- Proteinuria (≥300 mg/24 h)

- Complications can include progression from preeclampsia without severe features to preeclampsia with severe features.

3-Preeclampsia with Severe Features

Pathophysiology:

The pathophysiology of preeclampsia with severe features is the same as preeclampsia, but involves **severe diffuse vasospasm** and **more intense capillary injury** to where the ischemia demonstrates itself in overt, usually multiorgan system injury.

Signs & Symptoms:

Characteristic presenting symptoms include:

- presence of new onset of persistent headache
- epigastric pain
- visual disturbances
- BP =>160\110
- Decrease platelets
- Increased liver enzymes
- Elevation in creatinine (when the value of creatinine is normal =>1.1 or doubling of creatinine in someone with no known kidney disease is considered abnormal, because in pregnancy creatinine should be low 0.4 - 0.8)
- Pulmonary edema (vasoconstriction leads to more stress on the heart)

Diagnosis:

Diagnosis is made in the presence of (at least) mild elevation of BP and mild proteinuria plus any one of the following:

- **Sustained BP** elevation of ≥160/110
- **Evidence of maternal jeopardy:** may include symptoms (headache, epigastric pain, visual changes), thrombocytopenia (platelet count <100,000/mL), doubling of liver transaminases, pulmonary edema, serum creatinine >1.1 mg/dL, or doubling of serum creatinine these are all indication to deliver a preterm baby.
- Possible **edema**

Risk Factors:

Risk factors are the same as preeclampsia, with the addition of diseases with small vessel disease such as:

- systemic lupus and
- long standing overt diabetes.

Lab abnormalities:

- Evidence of **hemoconcentration** is shown by elevation of hemoglobin, hematocrit, blood urea nitrogen (BUN), serum creatinine, and serum uric acid. **Proteinuria** is present.
- Evidence of **disseminated intravascular coagulation (DIC)** or liver enzyme elevation would move the diagnosis from preeclampsia without severe features to preeclampsia with severe features.

Complications:

- Can include progression from preeclampsia with severe features to eclampsia.

Management:

- Aggressive **prompt delivery** is indicated for preeclampsia with severe features at any gestational age with evidence of maternal jeopardy or fetal jeopardy. Main goals are seizure prevention and BP control.
- **Administer IV MgSO4** to prevent convulsions. Give a 5 g loading dose, then continue maintenance infusion of 2 g/h. Continue IV MgSO4 for 24 hours after delivery. Usually magnesium is given for 48 hrs. Need to monitor urine output, reflexes, RR.
- **Lower BP** to diastolic values 90–100 mm Hg with
  - IV **hydralazine** (the best).
  -**labetalol**(Avoid if evidence of asthma or acute heart failure).
  -**Nifedipine .**
  -More aggressive BP control may jeopardize uteroplacental fetal perfusion.
- **Attempt vaginal delivery** with IV oxytocin infusion if mother and fetus are stable.
- Cesarean section is only for obstetric indications.
- **Conservative inpatient management** may rarely be attempted in absence of maternal and fetal jeopardy with gestational age 26–34 weeks if BP can be brought <160/110 mm Hg. This should take place in an intensive care, tertiary-care setting. Continuous IV MgSO4 should be administered, and maternal betamethasone should be given to enhance fetal lung maturity.

4-Eclampsia

Diagnosis:

- Eclampsia is the presence of **unexplained generalized seizures** (grand mal seizures) in a hypertensive, proteinuric pregnant woman in the last half of pregnancy .

Pathophysiology:

- **Severe diffuse cerebral vasospasm** resulting in cerebral perfusion deficits and cerebral edema.

Signs & Symptoms:

- In addition to those presenting symptoms of mild and severe preeclampsia, the most significant finding is **unexplained tonic-clonic seizures.**

Lab abnormalities:

Are the same as those found with mild and severe preeclampsia.

- Evidence of **hemoconcentration** is shown by elevation of hemoglobin, hematocrit, blood urea nitrogen (BUN), serum creatinine, and serum uric acid.
- **Proteinuria** is present.
- Evidence of **disseminated intravascular coagulation (DIC)** or liver enzyme elevation would move the diagnosis from preeclampsia without severe features to preeclampsia with severe features.

Diagnosis:

- is the presence of **new-onset grand mal seizures** in a woman with preeclampsia that **can't** be attributed to other causes.
- Eclamptic seizures often induce a fetal bradycardia that usually resolves after: maternal stabilization and correction of hypoxia.

Risk Factors:

- are the same as in preeclampsia.
- A primary seizure disorder does not predispose to eclampsia.

Management:

- Eclampsia is a true obstetric **emergency.**
- The first step is to protect the mother 's airway and tongue.
- Give oxygen by face mask to relieve hypoxia.
- **Administer MgSO4** with an IV bolus of 5 g to stop seizures, continuing maintenance infusion rate of 2 g/h. Continue IV MgSO4 for 24 hours after delivery.
- Magnesium sulfate is used to prevent seizures in order to get the baby out
- **Aggressive prompt delivery** is indicated for eclampsia at any gestational age after stabilization of the mother and the fetus. Attempt vaginal delivery with IV oxytocin infusion if mother and fetus are stable, If not do C-section
- **Lower diastolic BP** between 90–100 mm Hg with IV hydralazine and/or labetalol (blood pressure and pulse oximetry should be recorded every 10 minutes.)

Notes on management of pre-eclampsia and eclampsia:
-When you give Magnesium sulfate (**MgSO4**) , you should **assess the patient's deep tendon reflexes**, because if the patient lose (decrease) deep tendon reflexes while on Magnesium, it is a sign that if Magnesium is continued, it will decrease her respiratory drive, cut off diaphragm and have her not breath (Magnesium sulfate toxicity) > **give calcium as antidote**

-In order to decide the management you should balance risk of baby coming out vs benefit of baby staying in, based on:
1-Number and severity of severe features : the higher the blood pressure, the worse proteinuria, the worse the headaches , the worse the pain or elevation of LFT, means that the disease is progressing
2-Stability of mom vs baby
3-Fetal development :
37 weeks (at term) no benefit of staying in
20 weeks is abortion no benifit of staying in
20-37 weeks is viable : the closer to 24 weeks you are the more likely the baby will benefit of staying in .the closer to term 37 the less likely the baby will benefit from staying in, the more you are likely to deliver

Complications:

- intracerebral hemorrhage
- possible death

5- Chronic Hypertension With or Without Superimposed Preeclampsia

Pathophysiology:

Pathophysiology is **vasospasm** causing **decreased end-organ perfusion**, resulting in injury and damage. The acute problems arise from excessive systolic pressures, whereas the long-term problems arise from excessive diastolic pressures.

Risk Factors:

Most chronic hypertension (HTN) is idiopathic without specific antecedents. Risk factors are:

- obesity,
- advanced maternal age
- positive family history
- renal disease
- diabetes
- systemic lupus erythematosus

Diagnosis: (Without SIPE)

Diagnosis of chronic HTN is made when BP ≥140/90 mm Hg with onset before the pregnancy **or** before 20 weeks' gestation.

Diagnosis: (With SIPE)

Diagnosis is made on the basis of established chronic HTN along with any of the following:

- documented **rising BP values**
- demonstrated **worsening proteinuria (≥0.3 g in a 24-hour collection)** after the **20th week** of gestation.
- evidence of **maternal jeopardy** (headache, epigastric pain, visual changes, thrombocytopenia [platelet count <100,000/mL], elevated liver enzymes, pulmonary edema, oliguria [<750 mL/24 h], or cyanosis).
- Edema may or may not be seen.

Lab abnormalities:

include the following:

- Mild HTN and no end-organ involvement have normal lab tests, whereas those with renal disease may have evidence of decreased renal function including proteinuria, lowered creatinine clearance, and elevated BUN, creatinine, and uric acid.
- Chronic HTN patients have a spectrum of etiologies and disease severity.

Prognosis:

Pregnancy prognosis with chronic HTN is as follows:

- **Good:** Favorable maternal and neonatal outcome is found when BP 140/90–179/109 mm Hg and no evidence of end-organ damage.
- **Poor:** Pregnancy complications are more common in patients with severe HTN with the following end-organ damage: cardiac, renal, and retinal.
    - **Renal disease:** pregnancy loss rates increase significantly if serum creatinine value >1.4 mg/dL
    - **Retinopathy:** long-standing HTN is associated with retinal vascular changes including hemorrhages, exudates, and narrowing
    - **Left ventricular hypertrophy:** seen mostly in women with prolonged BP values >180/110 mm Hg
- **Worst:** Tenfold higher fetal loss rate if uncontrolled HTN (before conception or early in pregnancy) and chronic HTN with superimposed preeclampsia.

Pregnancy prognosis with chronic HTN <u>with</u> superimposed preeclampsia (25% of patients with chronic HTN) is as follows:

- Risk factors include renal insufficiency, HTN for previous 4+ years, and HTN in a previous pregnancy.
- Adverse pregnancy outcomes for both mother and baby are markedly increased.
- Abruptio placentae incidence is markedly increased.

Elevated blood pressure is usually used as a marker for a patient who could be developing pre-eclampsia, but in case of chronic hypertension you can no longer use the blood pressure as a marker for her developing a more severe disease. So the follow up is close monitoring of the patient , more frequent assessments, more frequent urine analysis and US assessing for intrauterine growth restriction

Management:

- **Conservative outpatient management** for uncomplicated mild-to- moderate chronic HTN.
- **Stop drug therapy.** Attempt discontinuation of antihypertensive agents. Follow guideline outlined.
- **Serial sonograms** and antenatal testing are appropriate after 30 weeks' gestation to monitor for increased risk of IUGR.
- **Serial BP and urine protein** assessment is indicated for early identification of superimposed preeclampsia.
- **Induce labor at 38 weeks.**

Aggressive prompt delivery for chronic HTN with superimposed preeclampsia at any gestational age:

- Administer IV **MgSO4** to prevent convulsions. Continue IV MgSO4 for 24 hours after delivery.
- **Keep diastolic BP** between 90 and 100 mm Hg with IV hydralazine and/or labetalol.
- Attempt **vaginal delivery** with IV oxytocin infusion if mother and fetus are stable.

Complications:

Complications can include progression from chronic HTN to superimposed preeclampsia, which can lead to maternal and fetal death.

Maternal complication:

- HELLP Syndrome.
- CNS: eclamptic seizure, stoke.
- Hepatic: subcapsular hematoma
- Renal: acute tubular necrosis “dark Black urine”.
- Hematological: hemorrhage, DIC.

Fetal complication:

- Preterm delivery
- Placental abruption due to high blood pressure
- Fetal growth restriction
- Fetal death.

Antihypertensive drug therapy issues :

- **Discontinuing medication**s Pharmacologic treatment in patients with diastolic BP <90 mm Hg or systolic BP <140 mm Hg does not improve either maternal or fetal outcome.
- **Maintaining medications** The drug of choice is methyl-dopa because of extensive experience and documented fetal safety , then calcium channel blockers, labetalol
- **“Never use” medications:** Angiotensin-converting enzyme inhibitors are contraindicated in pregnancy, as they have been associated with fetal hypocalvaria, renal failure, oligohydramnios, and death. **Diuretics** should not be initiated during pregnancy owing to possible adverse fetal effects of associated plasma volume reduction.
- **BP target range**. Reduction of BP to normal levels in pregnancy may jeopardize uteroplacental blood flow. Maintain diastolic values between **90–100 mm Hg.**

OB TRIAD

Chronic HTN:

- Pregnancy <20 wk or prepregnancy
- Sustained HTN (>140/90 mm Hg)
- +/– proteinuria

OB TRIAD

Chronic HTN with Superimposed Preeclampsia

- Chronic HTN
- Worsening BP
- Worsening proteinuria

6-HELLP Syndrome

Definition:

HELLP syndrome occurs in 5–10% of preeclamptic patients and is characterized by:

- hemolysis (H)
- elevated liver enzymes (EL) ALT/AST
- low platelets (LP)
- Elevated creatinine and serum uric acid because the excretion is decrease from the kidney

What blood test that shows hemolysis?

- Increase LDH: first thing to check.
- Increase bilirubin: we don't do it routinely
- Decrease haptoglobin: we don't do it routinely
- Decrease hemoglobin.

It can be confused with thrombotic thrombocytopenic purpura and hemolytic uremic syndrome. HTN, although frequently seen, is not always present.

Risk Factors:

- HELLP syndrome occurs two times as often in multigravidas as primigravidas.

Management:

- **Prompt delivery** at any gestational age.
- Use of maternal **corticosteroids** may enhance postpartum normalization of liver enzymes and platelet count.

Treated the same as pre-eclampsia and have the same pathology

Complications:

Complicating conditions associated with HELLP include:

- DIC,
- abruptio placentae,
- fetal demise,
- ascites, and hepatic rupture.

OB TRIAD:
HELLP Syndrome

- Hemolysis
- ↑ liver enzymes
- ↓ platelets

Summary (Meded)

	Transient HTN Can come to pregnant or non pregnant patient	Chronic HTN (usually know about it before pregnancy	Gestational HTN	Preeclampsia Without Severe Features (PEC) | old name (mild pre-eclampsia)	Preeclampsia With Severe Features (SPEC) | (old name (severe pre-eclampsia)	Eclampsia
Blood pressure	=>140/80 Only one reading to make the diagnosis	=>140/80	=>140/80	=>140/80	=>160/110 mmHg	
Timing of onset	Non sustained elevation in BP	Sustained elevation in BP with onset before 20 weeks	Sustained elevation in BP with onset after 20 weeks	Sustained elevation in BP with onset after 20 weeks	Sustained elevation in BP with onset after 20 weeks	Sustained elevation in BP with onset after 20 weeks
Urine analysis	-	-	-	Proteinuria >300 mg/dL	Severe Proteinuria > 5 g/dL	
Alarm symptoms	-	-	-	-	Present	Active seizures
Treatment	-	Alpha-methyldopa (best) Labetalol hydralazine		At term : >37 weeks = deliver Not term <37 weeks= wait	Give MgSO4 and deliver , age is irrelevant : usually vaginally by induction	Give MgSO4 and deliver , age is irrelevant : usually emergency C-section
Follow up	Ambulatory BP monitoring (log)	Close monitoring Frequent assessment U/A US	Can progress to pre-eclampsia Close monitoring U/A US Frequent assessment	More frequent follow ups (weekly) Continuous Screen for alarm symptoms and worsening of proteinuria		

Teaching case (video case)

An 18 year old G1P0 currently at 38 0/7 weeks presents for her routine prenatal visit. She has had an uncomplicated pregnancy up to this point, with the exception of a late onset of prenatal care and obesity (BMI of 35 kg/m2). She reports that during the past week, she has noted some swelling of her hands and feet. She also has been feeling a bit more fatigued and has had a headache on and off. She reports good fetal movement. She has had some contractions on and off, but nothing persistent. Her blood pressure is 147/92 and her urine dip has 1+ protein/no ketones/no glucose. The fundal height measures 36 cm, the fetus is cephalic with a heart rate of 144 bpm. On physical exam you note that the patient has 3+ pretibial edema, and trace edema of her hands and face. She has 2+ deep tendon reflexes and 2 beats of clonus. You review her blood pressures up to this point and note that at the time of her first prenatal visit at 18 weeks, her blood pressure was 130/76 and she had no protein in her urine. However, since that visit, her blood pressures seem to have been climbing higher with each visit. Her last visit was one week ago, and she had a blood pressure of 138/88 with trace protein in the urine and she has gained 5 pounds

Questions

1- What is considered a hypertensive blood pressure during pregnancy?

In pregnancy, hypertension is defined as either a systolic blood pressure ≥ 140 or diastolic blood pressure ≥ 90 or both. This patient has preeclampsia (gestational hypertension with proteinuria)

2- What types of hypertensive syndromes can occur during pregnancy?

- **Chronic hypertension:** Requires that the patient have documented hypertension preceding 20 weeks gestation, or where hypertension is first noted during pregnancy and persists for longer than 12 weeks postpartum.
- **Preeclampsia-eclampsia:** Development of new onset hypertension and proteinuria after 20 weeks of pregnancy. Is stratified into mild and severe forms. There are atypical forms of preeclampsia as well.
- **Preeclampsia superimposed on chronic hypertension:** Superimposed preeclampsia should be reserved for those women with chronic hypertension who develop new-onset proteinuria (≥ 300 mg in a 24-hour collection) after the 20th week of pregnancy. In pregnant women with pre existing hypertension and proteinuria, the diagnosis of superimposed preeclampsia should be considered if the patient experiences sudden significant increases in blood pressure or proteinuria or any of the other signs and symptoms consistent with severe preeclampsia.
- **Gestational Hypertension:** Hypertension without proteinuria which first appears after 20 weeks gestation or within 48 to 72 hours after delivery and resolves by 12 weeks postpartum.

3- How does the physiology of preeclampsia lead to the clinical symptoms and findings?

- Hypoxia, hypoperfusion and ischemia lead to the clinical placental pathophysiology (with fetal compromise: IUGR, oligohydramnios, placental abruption).
- Systemic endothelial dysfunction leads to central & peripheral edema, proteinuria, and hypertension (from disruption of vascular regulation). Endothelial dysfunction in target organs leads to headache, epigastric pain, and renal dysfunction.
  Microvascular endothelial destruction leads to release of procoagulants and DIC.

4- What are the laboratory findings that support a diagnosis of preeclampsia-eclampsia syndrome?

- Proteinuria (> 300 mg on a 24 hour urine collection).
- Elevated hematocrit.
- Hemolysis.
- Thrombocytopenia (< 100,000 cells/mm3).
- Elevated liver enzymes (ALT/AST twice normal).
- Elevated serum uric acid concentration.

5- What types of maternal and fetal complications are associated with preeclampsia-eclampsia syndrome?

❖ **Maternal:**

- CNS: eclamptic seizure, stroke.
- Cardiopulmonary: pulmonary edema .
- Hepatic: Subcapsular hematoma or hepatic rupture.
- Renal: renal failure or acute tubular necrosis.
- Hematologic: hemorrhage, DIC.

❖ **Fetal:**

- Preterm delivery
- Placental abruption
- Fetal growth restriction
- Hypoxic ischemic encephalopathy
- Fetal death