
# Hypertensive Disorders in Pregnancy

429 OB/GYN Team

Sources: Lecture ppt., Sakala (BRS & High-Yield), Hacker & Moore

By: Dona Baraka, Roa Alsajjan & Afnan AlTamimi

[Company Address]

# PRE-ECLAMPSIA/PET (PRE-ECLAMPSIC TOXEMIA)

## INCIDENCE

### PERCENTAGE

Happens in 5-8% of pregnancies, and is the 3rd leading cause of maternal morbidity and mortality due to CNS hemorrhage and strokes.

## RISK FACTORS

- Older Gravidas
- Pre-Existing Hypertension
- Cerebrovascular Diseases
- First Pregnancy with new Partner
- Obesity
- Renal Disease
- Collagen Vascular Diseases
- Extremes of Productive Age
- Diabetes Mellitus
- Multiple Pregnancies
- Black Race
- Thrombophilias

## DEFINITION

It is a syndrome unique to pregnancy, characterized by the new onset of hypertension and proteinuria in the last half of gestation (after 20 week of gestation).

## DIAGNOSIS

The following 2 criteria are essential for the diagnosis of pre-eclampsia:

### 1. BLOOD PRESSURE (BP)

- **Measurements in pregnancy principle**:
  - Sitting position
  - After 10minute resting time
  - With an appropriate size of the cuff, a mercury sphygmomanometer (the 1st and 5th Kororkoff sounds would reflect the Systolic BP and Diastolic BP respectively.
- **Positive Hypertension**: ONLY if after 20 weeks of gestation age, should we consider it
  - ***Hypertension:*** when diastolic BP is ≥90 mmHg, and systolic BP is ≥140 mmHG after <u>two measurements</u> taken on the same arm and after 5min apart.
  - ***Severe Hypertension:*** diastolic BP is ≥110 and systolic is ≥160 after a <u>single measurement</u>.

**In pregnancy, BP levels differ according to the following:**

- ***Position*** (low in left-lateral-decubitus position, high in sitting and flickers between high and low in supine)
- ***Gestational Age*** (It is also low in 1st and 2nd trimesters of gestational age, and rise up to normal in the 3rd trimester.

- In the past, hypertension used to be diagnosed as a rise of 30 in systolic and 15 in diastolic but now it is not used anymore as a criterion for diagnosis.

## 2. PROTEINURIA

- **Pathophysiology:**
  Vasospasm → afferent vasoconstriction of the Glomeruli → Glomerular infiltration and damage → high permeability to proteins (furthermore also there would be a decrease in GFR and so Oliguria)
- **Positive Proteinuria:** ONLY if after 20 weeks of gestation age, should we consider it
  - Urine protein ≥ 300 mg on 24 hours collection
  - Proteinuria of ≥2+ on dipstick of a 24 hour urine
  - Edema and weight gain (as consequences of proteinuria) are still <u>not</u> considered as a part of the current definition.

When BP and proteinuria rise in the early second trimester (14 to 20 weeks of gestation), a hydatiform mole or choriocarcinoma should be considered.

# CLINICAL AND LABORATORY MANIFESTATIONS

## VASCULAR AND PULMONARY

- Diastolic BP ≥ 110 (severe)
- Abnormal weight gain and edema (earliest signs, reflect expansion of extracellular fluid compartment)
- Hypovolemia result, and Hematocrit increase
- Pulmonary edema → chest pain and shortness of breath

## RENAL FUNCTION

- Earliest change: increase in uric acid concentrations
- Proteinuria: > 3g/24 hrs
- Oliguria: <500 ml/24 hrs
- Serum albumin: <18 g/L
- Serum creatinin: elevated

## LIVER FUNCTION

Vasospasm → focal hemorrhages and infarction, leading to:

- Elevated liver enzymes
- Right upper quadrant or epigastric pain
- Severe nausea and vomiting

## CENTRAL NERVOUS SYSTEM EFFECTS

- Visual disturbances (due to retinal vasospasm)
- Sudden loss of vision (due to occipital lobe ischemia)
- Frontal headache
- At the eclampsia stage; seizures occur.

## H.E.L.L.P SYNDROME

- **H**emolysis
- **E**levated **L**iver enzymes
- **L**ow **P**latelets count

## FETAL (PLACENTAL FUNCTION)

Vasospasm in the uterosacral artery → placental infarction and decrease uteroplacental perfusion → fetal compromise

- IUGR (intrauterine growth restriction)
- Oligohydraminous and abnormal doppler
- Extensive placental infarctions → retroplacental hemorrhage or abruption → perinatal morbidity and mortality (IUFD; intrauterine fetal death)

## ECLAMPSIA

It is the presence of tonic-clonic seizures in a woman with pre-eclampsia that cannot be attributed to other causes. The more severe the pre-eclampsia the greater risk for developing seizers. 25% of it is before deliver, 50% during deliver and 25% is after delivery.
(Seizures after 2 days post-partum would rise suspicion to other causes of epilepsy).

## INITIAL EVALUATION

A physician must know 3 facts about the patient; 1st, is the pre-eclampsia mild, moderate or severe? 2nd any evidence of fetal compromise and 3rd to know if the fetus is mature enough to deliver without any complications post-partum.

## RISK FACTORS

- Maternal age >40
- Previous pre-eclampsia or family history of it
- Presence of anti-phospholipid antibodies
- Obesity (BMI > 35)
- BP ≥ 140/80 mmHg.
- Long period since last pregnancy (> 10 years)
- Multiple Gestations

## EVALUATION GOALS FOR THE MOTHER

- Blood Pressure
  - Assess severity (severe is > 160/110mmHg)
  - High BP is a risk factor for cerebrovascular accident and not eclampsia/seizures
- CNS
  - Headaches; severity
  - Visual Disturbances: blurring or Scotoma (an area of depressed vision in the visual field, surrounded by an area of less depressed or of normal vision).
  - Other nervous symptoms: tremors, irritability, hyperreflexia, somnolence, nausea and vomiting
- Hematologic: bleeding and petechae
- Hepatic:
  - RUQ and epigastric pain
  - Nausea and vomiting
- Lab:
  - CBC (Hb and platelets)
  - Coagulation profile: PT, APTT, INR and fibrinogen
  - Bilirubin
  - LFT: ALT, AST, LDH and Albumin
  - Glucose and ammonia to exclude acute fatty liver
  - U/E: proteinuria (by dipstick or 24hr collection), urea, creatinin and uric acid

## EVALUATION GOALS FOR THE FETUS

- Fetal movement
- NST (A nonstress test; uses electronic monitoring to check the health of an unborn baby)
- U/S
  - Growth; IUGR
  - BPP (The biophysical profile; a noninvasive test that predicts the presence or absence of fetal asphyxia and, ultimately, the risk of fetal death)
  - Doppler
  - AFV or Oligohydraminous (AVF; abnormal vaginal flora, this is related to the fluid secreted by the fetal respiratory tract)

# CLASSIFICATION OF HYPERTENSIVE DISORDERS IN PREGNANCY

## PRE-EXISITING CHRONIC HYPERTENSION

### WITHOUT PRE-ECLAMPSIA

- History of hypertension
- When hypertension first appear during pregnancy but persist till after 12 weeks post-partum
- Any hypertension <20 weeks gestation
- Most common type is 'essential' hypertension

### WITH SUPER-IMPOSED PRE-ECLAMPSIA

- Worse prognosis than each alone
- Diagnosis is made just like chronic hypertension, only that proteinuria appear >20 weeks of gestation
- Sometimes proteinuria appears before 20 weeks, but rises more after, and this is a sign for severe PET (pre-eclampsia)

## GESTATIONAL HYPERTENSION

### WITHOUT PRE-ECLAMPSIA

- Any hypertension that appears >20 weeks of gestation
- Without proteinuria
- Resolves < 12 weeks post-partum
- The diagnosis is retrospective (we only know it is gestation after the way it resolves)

### WITH PRE-ECLAMPSIA

- Comes with new proteinuria
- Comes with new adverse conditions

# MANAGEMENT

## GOALS

1. Prevention of adverse maternal outcomes (organ damage, seizures, CVA)
2. Prevention of adverse fetal complications (abruption, IUFD, IUGR)
3. Symptomatic support
4. **Delivery is the definitive treatment**
5. Deliver when:
    a. GHTN is associated w/adverse conditions, regardless of gestational age
    b. At or near term

## SUPPORTIVE MANAGEMENT

1. Stress reduction: Quiet environment, clear explanation of Rx plan, consistent confident team approach
2. Pain relief
3. Antiemetics
4. Minimize liver palpation

## ANTIHYPERTENSIVE THERAPY

1. Minimize the risk of CVA/death
2. **It is unclear whether antihypertensive therapy for mild-moderate HTN (diastolic 90-105) is beneficial (they are not indicated in these cases)**
3. Gain time for further assessment
    a. Facilitate vaginal delivery if possible
    b. Prolong gestation if premature & appropriate

Caution must always be exercised to not lower the arterial pressure too much or too rapidly → may result in ↓↓ uteroplacental blood flow and fetal distress

## ANTIHYPERTENSIVE AGENTS

### ACUTE

#### CALCIUM CHANNEL BLOCKERS

**Nefidipine**, orally

1. Immediate release (Adalat)
    a. May cause sudden drop in BP & fetal distress
    b. Reports of MI & CVA in the general population—should be avoided in patients at risk
2. Intermediate acting (Adalat PA)

MOA: Direct relaxation of the vascular smooth muscle

Immediate release:

- 5-10 mg p.o.
- Repeat in 30 min IF no response

Intermediate acting

- 10 mg p.o.
- Repeat dose at 30-45 min IF no response
- Onset of action: 90 min

#### BETA BLOCKERS

**Labetalol**

- 10-20 mg IV over 2 min every 10-30 min, up to 300 mg
- Onset of action in 5-10 min
- Max action 30 min
- IV infusion: 1-2 mg/min
- Increase by 1 mg q 15 min; Max 4 mg/min

## ARTERIOLAR DILATORS

### Hydralazine

- Should not be the first choice agent
- A metanalysis showed that it is associated with more adverse outcomes including:
  - Abruption
  - Fetal distress
  - Low apgar
  - Cs & oliguria
- It is less effective in BP control

- Onset of action: 5-10 min
- Max action 30 min
- 5-10 mg IV every 20 min
- Infusion 0.5-10 mg/hr

## MAINTENANCE

### *GOAL*

- Without co-morbid condition → BP 130-155/80-105
- With comorbid condition → BP 130-139/80-89

### *AGENTS*

1. Alpha-methyldopa
   a. Long Hx of safe use in pregnancy
   b. Drug of choice for essential HTN
2. Beta blockers (labetalol)
3. Calcium channel blockers

1) 500-1000 mg bd-qid

2) 100-600 mg bd-qid
Max 1200/d

3)
- Intermediate release 20-40 mg/d; Max 80
- Extended release 20-60 ng/d; Max 120 mg

## FLUID MANAGEMENT

- Monitor: urine output/hourly intake output
- Total IV intake should not exceed 80-125 ml/hr
- In case of oliguria (<15 ml/hr)
  - Follow serum creatinine
  - Watch for magnesium toxicity
  - Consider a small fluid bolus
  - Consultation if persistent
- Judicious fluid adminstration
- Beware of pulmonary edema

These patients experience: vasoconstriction, interstitial edema, and some degree of reduced intravascular volume → reduces urinary output

The most common management errors: fluid volume overload, excessive salt restriction & water intoxication

## SEIZURES PROPHYLAXIS

- Difficult to predict who will seize
- Not directly related to the degree of HPT or the level of proteinuria
- Mg SO4 (4 gm IV then 1-2 gm/hr) is the agent of choice for seizures prophylaxis in PET or for Rx of Eclampsia
  - Do not use Diazepam or Phenytoin unless Mg SO4 is contraindicated

### MAGNESIUM SULPHATE OVERDOSE

- Close observation for toxicity
  - Weakness, respiratory paralysis, somnolence, heart block
  - High risk: renal failure, oliguria
- ANTIDOTE
  - Stop MgSO4 infusion
  - 10% Calcium gluconate 10 ml IV over 3 min

## MANAGEMENT OF ECLAMPSIA

### ECLAMPSIA = CONVOLUTIONS (GENERALIZED TONIC- CLONIC SEIZURE) + PROTEINURIA + HYPERTENSION

- The management will be aggressive
  - Call for help this is something you cannot handle alone
  - Maternal lateral position
  - Protect the airway
  - MgSO4 for the seizures & continue for 24h post-partum
  - Post-seizure: oxygen, vital signs, fetal surveillance
  - Assess for evidence of abruption
  - Prompt delivery

Pathogenesis of eclamptic convulsions have included cerebral vasoconstriction or vasospasm hypertensive encephalopathy, cerebral edema or infarction, cerebral hemorrhage, and metabolic encephalopathy

### TRANSPORT

- Consider if resources limited & maternal/ fetal condition permits to tertiary centers
  - Maternal BP & symptoms stable
  - Fetal status reassuring
- D/W receiving centre & Pt/ family
- Antihypertensive agent if indicated
  lower the diastolic blood pressure to 90-100 mm/hg using hydralazine (direct arterial vasodilator) or labetalol (nonselective ß blocker)
- MgSo4 if indicated

**WE DON'T WANT TO LOWER HER BLOOD PRESSURE TO NORMAL LEVEL. IT WILL JEOPARDIZE PLACENTAL BLOOD FLOW**

### WHEN TO DELIVER?

- Gestational HPT at or near term
- Gestational HPT with adverse conditions irrespective of gestational age
- Mild IUGR alone is not an indication for delivery
- Role for prolonging pregnancy with significant prematurity in a facility with sufficient resources and give betamethasone to help in lung maturity

## PERI- & POST-PARTUM MANAGEMENT

- Gestational HPT may present or worsen after delivery
- Eclampsia
  - 50 % before labor
  - 25% in labor
  - 25% early postpartum
  - Rarely 2 days or more after delivery
- Mg SO4 should be continued for the first 24 hrs postpartum in high risk Pt
- Avoid abrupt drop in BP (aim for 80-100 diastolic)
- Avoid fluid overload
- Epidural analgesia is favored in the absence of low platelets or coagulopathy > risk of bleeding
- Multidisciplinary approach
- Patient must be monitored postpartum
- Can be discharged if BP remains <160/100 for at least 24 hrs

## PREVENTION

- ASA - low dose (Acetylsalicylic acid) = aspirin
  - Small role in the prevention of early onset (<34 wks) gestational HPT with proteinuria
  - Delay the onset of proteinuria
  - Reduce the risk of severer HPT (HELLP, IUGR, antiphospholipid syndrome)
- Calcium supplement (1-2 gm Ca carbonate/day)
  - Decrease the risk of HPT in preg in women who are considered high risk for gestational HPT & in communities with low Ca intake
- Antioxidants (Vit C, E) are not beneficial & may be harmful (increased risk of prematurity)
- In sakala: large prospective randomized studies have shown that **no prophylactic (aspirin & calcium) intervention for preeclampsia improves pregnancy outcome**
- Current management schemes designed to prevent eclampsia are based on early detection of gestational hypertension or preeclampsia and subsequent use of preventive therapy in such women
  http://anesth-chips.fr/IMG/pdf/MATER_ECLAMPsieCAT_Sibai_OG_05.pdf

## CONCLUSION

- Gestational HPT with proteinuria & adverse condition is an OB Emergency
- Multidisciplinary approach for management depanding on the severity and the gestational age
- Prompt recognition & stabilization of the mother & fetus are important
- The cure is delivery
- Timing of delivery is based on
    - Severity
    - Fetal maturity & wellbeing
    - Maternal status
- Antihypertensive Rx is used to prevent CVA not seizures
- No evidence that antihypertensive Rx for mild –moderate HPT improves perinatal outcome
- Magnesium Sulfate is the drug of choice for prevention & treatment of Eclampsia

## MANAGEMENT SUMMARY

| | Monitoring | Medication | Delivery |
|---|---|---|---|
| **Chronic (pre-existing) HTN** | - Outpt. Conservative management<br>- Monthly US<br>- If IUGR suspected: weekly NST/BPP<br>- Serial BP + urine protein (check for superimposed) | Only for severe<br>- Methyldopa & labetalol are 1st line | Vaginal delivery at term if uncomplicated |
| **Preeclampsia-eclampsia** | - Mild (<38 weeks): in OR outpatient<br>- Severe: Always in-hospital + immediate delivery (except some cases if between 23-32 wks & uncomplicated) | - Antihypertensive: nifedipine, labetalol or hydralazine (until DBP = 90-100 mmhg)<br>- Seizure prophylaxis w/MgSO4 (to prevent intrapartum seizures)<br>- Betamethasone → ↑ fetal lung surfactant | - Vaginal preferred for all cases<br>- Term delivery if mild<br>- Cesarean only if indicated |
| **Preeclampsia superimposed on chronic HTN & HELLP** | Immediate delivery (Why? High rate of abruptio placenta + poor perinatal outcomes). Rx same as preeclampsia-eclampsia. | | |
| **Gestational** | Same as chronic HTN | No medications | Vaginal at term |

## SUMMARY

| Criteria for aggressive management | Guidelines |
|---|---|
| **1) Mild/severe preeclampsia >37 wks** | - Maintain DBP between 90-100<br>- **AntiHTN Rx:**<br>- Nifedipine, Labetalol, Hydralazine<br>**- Seizure prophylaxis: MgSO4 IV**<br>- 5g over 20 min loading dose<br>- 2g/hr infusion maintenance<br>- Maintenance for 24 hrs after delivery<br>- **MgSO4 toxicity:**<br>- 10mg/dl = loss of deep tendon reflexes<br>- 15mg/dl = resp. paralysis<br>- 25mg/dl = cardiac arrest<br>- Antidote: IV calcium gluconate<br>- **If unstable**: C-section |
| **2) Severe preeclampsia <26 wks** | |
| **3) Severe preeclampsia 26-34 wks + maternal jeopardy:**<br>- Severe persistent headache<br>- Visual changes<br>- Hepatocellular injury<br>- Pulmonary edema<br>- Abruptio placenta<br>- Evidence of DIC | |
| **4) Severe preeclampsia 26-34 wks + fetal jeopardy:**<br>- Repetitive severe variable decelerations<br>- Repetitive late decelerations<br>- Repetitive BPP <4<br>- Oligohydraminos (AFI < 4 cm)<br>- IUGR (weight < 5$^{th}$ percentile) | |
| **5) Chronic HTN w/superimposed preeclampsia** | |
| **6) Eclampsia or HELLP syndrome** | |
| **Criteria for conservative in-patient management** | **Guidelines** |
| **1) Mild preeclampsia remote from term (< 37 wks)** | - Monitor BP every 4 hrs<br>- Daily urine dipstick<br>- Twice-weekly 24-hr urine protein<br>- Weekly LFT&electrolytes<br>- Delivery if it becomes severe |
| **2) Severe preeclampsia in:**<br>- Gestational age > 26 wks but < 34 wks<br>- BP persistently > 160/110<br>- No maternal jeopardy<br>- No fetal jeopardy | - Intensive monitoring<br>- Cautious volume expansion<br>- Aggressive anti-HTN Rx<br>- MgSO4<br>- Corticosteroids |
| **Criteria for conservative in-patient management** | **Guidelines** |
| **1) Transient HTN (BP mildly elevated & NO proteinuria)**<br>**2) Uncomplicated chronic HTN** | - Bed rest<br>- Home BP monitoring<br>- Twice-weekly visits |