Hypertensive Disorders during pregnancy

Dr Amal Barakat, MD

Jordan University

6th Year Medical Class

August/2024

Hypertensive Disorders during pregnancy

- Chronic Hypertension
- Preeclampsia superimposed on chronic hypertension
- Gestational Hypertension
- Preeclampsia
- Eclampsia

The diagnostic criteria for hypertension in pregnancy

- **The diagnostic criteria for hypertension in pregnancy were similar to those for non-pregnant individuals.**
- **<u>For mild hypertension</u>: a systolic blood pressure (SBP) of ≥ 140mm Hg or a diastolic blood pressure (DBP) of ≥ 90mm Hg on at least 2 separate occasions more than 4 hours apart.**
- **<u>For severe hypertension</u>: a SBP ≥ 160 mm Hg or a DBP ≥ 110 mm Hg**

Proteinuria

- **Proteinuria is the presence of ≥300 mg of protein in a 24-hour collection of urine.**
- **<u>OR</u> urinary protein to creatinine ratio of ≥30 mg/mmol (0.3 mg /dl).**
- **If using albumin:creatinine ratio as an alternative to protein:creatinine ratio to diagnose pre-eclampsia in pregnant women with hypertension: use 8mg/mmol as a diagnostic threshold.**
- **<u>OR</u> two readings of at least ++ on dipstick analysis of a midstream or catheter urine specimen.**

❖ Chronic Hypertension

- **HTN diagnosed prior to pregnancy or before 20 weeks gestation (and persisting 12 weeks after pregnancy).**

Classification of Chronic Hypertension

- **Primary (idiopathic) or essential**
- **Secondary to:**
- **Renal causes :Glomerulonephritis, Renal Artery Stenosis, Polycystic kidneys.**
- **Endocrine causes: Cushing's syndrome ,Conn's syndrome, Phaeochromocytoma ,Thyrotoxicosis.**
- **Vascular causes: Coarctation of the Aorta**

Management of pregnant women with Chronic Hypertension

- **Offer pregnant women with chronic hypertension advice on:**
- A referral to a specialist in hypertensive disorders of pregnancy
- Weight management
- Exercise
- Healthy eating
- Lower the amount of salt in their diet

Management of pregnant women with Chronic Hypertension

- Stop antihypertensive treatment in women taking ACE inhibitors, ARBs, thiazide or thiazide-like diuretics if they become pregnant. ***There may be an increased risk of congenital abnormalities and neonatal complications if these drugs are taken during pregnancy.***

- Consider labetalol (an alpha and beta adrenergic antagonist) to treat chronic hypertension in pregnant women.
- Consider nifedipine (Calcium-Channel Blockers) for women in whom labetalol is not suitable
- Consider methyldopa (centrally-acting alpha-2 adrenergic agonist) if both labetalol and nifedipine are not suitable.

Management of Chronic Hypertension

- **Offer pregnant women with chronic hypertension aspirin 75 mg to 150 mg once daily from 12 weeks**

- **Offer testing Placental Growth Factor (PLGF) if women with chronic hypertension are suspected of developing pre-eclampsia.**
- **Note:**
- **In normal pregnancy PGIF levels rise and peak at 26-30 weeks.**
- **In Pre-eclampsia level of PIGF can be abnormally low due to placental dysfunction**

Preeclampsia superimposed on chronic hypertension

- Superimposed preeclampsia complicates about 20% of pregnancies in women with chronic hypertension.
- Superimposed preeclampsia refers to women with chronic arterial hypertension (primary or secondary) who develop preeclampsia (PE)
- **Superimposed preeclampsia (on chronic hypertension) is characterized by:**
- (1) New onset proteinuria (≥300 mg/24 h) in a woman with hypertension but no proteinuria before 20 weeks' gestation.
- (2) A sudden increase in proteinuria or BP, or a platelet count of less than 100,000/mm^3,or maternal organ dysfunction developing after 20 weeks gestation in a woman with hypertension.

❖ Gestational Hypertension

- **New hypertension presenting after 20 weeks of pregnancy <u>without</u> significant proteinuria.**
- **High BP>=140/90 in 2 reading 4 hours apart**

Management of Gestational Hypertension

- Consider **labetalol** to treat gestational hypertension.
- Consider **nifedipine** for women in whom labetalol is not suitable.
- Consider **methyldopa** if labetalol or nifedipine are not suitable.
- Base the choice on side-effect profiles, risk (including fetal effects) and the woman's preferences.

❖ Pre-eclampsia

- Pre-eclampsia is a **multisystem progressive** disorder characterized by the new onset of hypertension and proteinuria or the new onset of hypertension plus significant end-organ dysfunction with or without proteinuria, typically presenting after 20 weeks of gestation or postpartum.

Preeclampsia without proteinuria

- **In a patient with new-onset hypertension without proteinuria, the new onset of any of the following is diagnostic of preeclampsia**:
- Platelet count below 100,000/μL
- Serum creatinine level above 1.1 mg/dL or doubling of serum creatinine in the absence of other renal disease
- Liver transaminase levels at least twice the normal concentrations
- Pulmonary edema
- Cerebral or visual symptoms

Risk factors for Preeclampsia

- **Nulliparity**
- **Family history or personal history of PET**
- **Multifetal gestations**
- **Preeclampsia in a previous pregnancy**
- **Chronic hypertension**
- **Pregestational diabetes, Gestational diabetes**
- **Systemic Lupus Erythematosus (SLE)**
- **Antiphospholipid Antibody Syndrome**
- **Thrombophilia**
- **Prepregnancy body mass index greater than 30**
- **Maternal age 35 years or older**
- **Pregnancy interval of more than 10 years**
- **Kidney disease**
- **Obstructive Sleep Apnea**
- **Assisted Reproductive Technology**
- **Afro-Caribbean and South Asian racial origin**

Management of Preeclampsia without Severe Features

- **Before 37 weeks:**
- Expectant management is appropriate
- Antepartum testing: Offer a nonstress test (NST) and a biophysical profile (BPP) at the time of the diagnosis and twice per week until delivery.

- **Beyond 37 weeks:**
- Induction of labor is recommended.
- Cesarean section may be performed based on standard obstetric criteria.

Preeclampsia with Severe features

- **Preeclampsia with severe features is defined as the presence of one of the following symptoms or signs:**
- SBP of 160 mm Hg or higher or DBP of 110 mm Hg or higher, on two occasions at least 4 hours apart while the patient is on bed rest (unless antihypertensive therapy has previously been initiated).
- Impaired hepatic function as indicated by abnormally elevated blood concentrations of liver enzymes (to double the normal concentration), severe persistent upper quadrant or epigastric pain that does not respond to pharmacotherapy and is not accounted for by alternative diagnoses, or both.
- Progressive renal insufficiency (serum creatinine concentration >1.1 mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease)
- New-onset cerebral or visual disturbances
- Pulmonary edema
- Thrombocytopenia (platelet count < 100,000/Ml

Preeclampsia with Severe features may complain of the following:

- Severe Headache
- Visual disturbances: Blurred, scintillating scotomata
- Altered mental status
- Blindness: May be cortical or retinal
- Dyspnea, pulmonary edema
- Edema: Sudden increase in edema or facial edema
- Nausea, vomiting, epigastric or right upper quadrant abdominal pain
- Weakness or malaise: May be evidence of hemolytic anemia
- Clonus: May indicate an increased risk of convulsions
- As well as progressive deterioration in laboratory blood tests such as rising creatinine or liver transaminases or falling platelet count, or failure of fetal growth or abnormal doppler findings.

Maternal Complications of Severe PET

- **Central nervous system:** Eclampsia (seizures), Cerebral hemorrhage (stroke), Cerebral oedema, Cortical blindness, Retinal oedema, Retinal blindness.
- **Renal system:** Renal cortical necrosis, renal tubular necrosis, Renal failure.
- **Respiratory system:** Pulmonary edema, Laryngeal oedema.
- **Liver:** Jaundice, Elevated liver enzymes, HELLP syndrome (Hemolysis, Elevated liver enzymes, and Lowered platelets), Subcapsular hepatic hematoma, Hepatic rupture.
- **Coagulation system:** Disseminated Intravascular Coagulation (DIC), Microangiopathic hemolysis.
- **Placenta:** Placental infarction and Placental abruption.
- **Eclampsia**
- **Death:** **Major causes of death in pre-eclampsia are**: stroke, prolonged fitting and pulmonary edema

Long Term Maternal Complications of PET

- **Doubling in lifetime risk of cardiovascular disease (CVD)**
- **<u>Including</u>: Hypertension**
- **Ischemic heart disease**
- **Stroke**
- **Death from CVD**

Fetal Complications

- Ischemic encephalopathy
- Utero-Placental Insufficiency
- Growth Retardation
- Abruptio Placenta
- Stillbirth
- The various sequelae of premature birth

Management of Severe Pre-eclampsia

- Admission
- Two IV bore cannulas
- Foleys catheter & Input output chart
- Blood & Urine for Investigations and Evaluation
- Maternal Evaluation
- Fetal evaluation (Ultrasound, NST, Umbilical Artery Doppler)
- Discussing the case with the senior obstetrician, nursing & medical staff.
- Stabilization the blood pressure of the patient by giving one of the anti-hypertensive agents.
- Prophylactic treatment with magnesium sulfate is indicated for all patients with preeclampsia with severe features to prevent eclampsia and for fetal neuroprotection.
- Plan for delivery

Investigations

- **All women who present with new-onset hypertension should have the following tests**:

- Blood group& RH, Cross Match
- Complete blood cell (CBC) count
- LFT: Serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels
- KFT: Serum creatinine, Uric acid
- 24-Hour urine collection for protein and creatinine or urine dipstick analysis
- Coagulation profile (prothrombin time [PT], activated partial thromboplastin time [aPTT], and fibrinogen)

- **Additional studies to perform if HELLP syndrome is suspected are as follows:**
- Peripheral blood smear
- Serum lactate dehydrogenase (LDH) level
- Indirect bilirubin

Other Investigations

- **Head CT scanning is used to detect intracranial hemorrhage in selected patients with any of the following:**
- Sudden severe headaches
- Focal neurologic deficits
- Seizures with a prolonged postictal state
- Atypical presentation for eclampsia

Laboratory Findings in Severe PET

- **Urine analysis ---proteinuria**
- **Microangiopathic hemolytic anemia---elevated serum lactate dehydrogenase LDH or decreased serum Hepatoglobin**
- **Elevated hematocrit ---due to third spacing fluid**
- **Elevated serum creatinine**
- **Elevated serum uric acid**
- **Elevated serum transaminases**
- **Thrombocytopenia**
- **Prolonged prothrombin and partial thromboplastin**
- **Decreased fibrinogen**
- **Increased fibrin degradation products (FDP**

Anti-Hypertensive drugs in Severe Preeclampsia

- **Labetalol (oral or intravenous)**
- Labetalol:10-20mg IV
  The dose can be doubled every 10 minutes if proper response is not achieved

- **Oral nifedipine**
- 10mg orally repeated at 30 min.
- IV infusion can be used in severe cases.

- **Intravenous hydralazine.**
- Hydralazine: 5mg IV repeated every 20-30 min.

Magnesium Sulfate dose in Severe PET

- **Use the Collaborative Eclampsia Trial regimen for administration of magnesium sulfate**:
- A loading dose of 4 g should be given intravenously over 5 to 15 minutes, followed by an infusion of 1 g/hour maintained for 24 hours.
- If the woman has had an eclamptic fit, the infusion should be continued for 24 hours after the last fit.
- Recurrent fits should be treated with a further dose of 2 g to 4 g given intravenously over 5 to 15 minutes.(NICE) **[2010, amended 2019]**

Timing of Birth

- **Considering planned early birth could include any of the following known features of severe pre-eclampsia:**
- inability to control maternal blood pressure despite using 3 or more classes of antihypertensives in appropriate doses
- maternal pulse oximetry less than 90% (Remember: some pulse oximeters can underestimate or overestimate oxygen saturation levels)
- progressive deterioration in liver function, renal function, haemolysis, or platelet count
- ongoing neurological features, such as severe intractable headache, repeated visual scotomata, or eclampsia
- placental abruption
- reversed end-diastolic flow in the umbilical artery doppler velocimetry, a non-reassuring cardiotocograph, or stillbirth.

If early birth is necessary offer:

- **Antenatal corticosteroids**
- If early birth is considered likely within 7 days in women with pre-eclampsia, offer a course of antenatal corticosteroids in line with the NICE guideline on preterm labor and birth.

- **Magnesium Sulfate** for prevention of maternal eclampsia and fetal neuroprotection**.**

Cesarian Section Versus Induction of labor

- **Remember**: Delivery is the only cure for preeclampsia.

- Choose mode of birth for women with severe hypertension, severe pre-eclampsia or eclampsia according to the clinical circumstances and the woman's preference

Fluid management in Severe PET

- **Diuretics should be avoided**
- Patients should be fluid restricted when possible, at least until the period of postpartum diuresis.
- Total fluids should generally be limited to 80 mL/hr or 1 mL/kg/hr, unless there are other ongoing fluid losses (for example, hemorrhage).
- Aggressive volume resuscitation may lead to pulmonary edema

Postpartum Management

- Magnesium sulfate seizure prophylaxis is continued for 24 hours postpartum
- Liver function tests and platelet counts must document decreasing values prior to hospital discharge
- Elevated BP may be controlled with nifedipine or labetalol postpartum
- If a patient is discharged with BP medication, reassessment and a BP check should be performed, at the latest, 1 week after discharge
- Unless a woman has undiagnosed chronic hypertension, in most cases of preeclampsia, the BP returns to baseline by 12 weeks' postpartum
- Patients should be carefully monitored for recurrent preeclampsia, which may develop up to 4 weeks postpartum, and for eclampsia that has occurred up to 6 weeks after delivery

❖ Eclampsia

- **Eclampsia is defined as seizures that cannot be attributable to other causes in a woman with preeclampsia**

- Incidence: 5 in 10 000 deliveries and 1-2% of severe Pre-eclampsia cases.
- High maternal and fetal mortality
- It can occur antenatally, intra-partum and post-partum
- Eclampsia related complications include CVA (cerebro vascular accident), pulmonary oedema, renal failure, HELLP (haemolysis, elevated liver enzyme, and low platelet count) syndrome, DIC (Disseminated Intravascular Coagulation) and hepatic failure

- The pathophysiology is cerebral vasospasm leading to ischemia and cerebral edema

Management of Eclampsia

- **Seizure treatment and prophylaxis**
- The basic principles of airway, breathing, and circulation (ABC) should always be followed
- **Magnesium sulfate** is the first-line treatment for primary and recurrent eclamptic seizures
- Treat **active seizures** with IV magnesium sulfate : A loading dose of 4 g is given by infusion pump over 5-10 minutes, followed by an infusion of 1 g/hr maintained for 24 hours after the last seizure
- Treat **recurrent seizures** with an additional bolus of 2 g or an increase in the infusion rate to 1.5 or 2 g per hour
- **Lorazepam and phenytoin** may be used as second-line agents for **refractory** seizures.
- CS is indicated unless the mother is in active labor

Mg Sulfate in Preeclampsia with severe features & Eclampsia

- **Prophylactic treatment with Magnesium Sulfate is indicated for all patients with preeclampsia with severe features:**
- To Prevent eclampsia
- For Fetal neuroprotection

- **Magnesium Sulfate is the first-line treatment for primary and recurrent eclamptic seizures.**

Common Side Effects of Mg Sulfate

- Magnesium sulfate produces flushing, sweating, and a sensation of warmth due to its peripheral vasodilator effects when infused intravenously.
- Nausea, Vomiting
- Headache
- Palpitation
- Generalized muscle weakness
- Diplopia

Signs of Mg Sulfate toxicity?

- **Therapeutic level: is 4-7 mEq/L**

- **Signs of Magnesium Sulfate toxicity:**
- Absent tendon reflexes seen at the level of (9.6-12 mg/dL) (> 7 mEq/L)
- Respiratory depression occurred at the level of (12-18 mg/dL) (> 10 mEq/L)
- Pulmonary Edema
- Cardiac Arrythmias
- Cardiopulmonary Arrest occurred at the level of (24-30mg/dL) (> 25mEq/L)

How to check for Mg Sulfate toxicity

- **Presence or absence of Patellar reflex**
- **Monitoring of Blood pressure, Pulse & Respiratory rate**
- **Monitoring of Urine output (30ml/hour)**
- **Monitoring of Serum Mg Sulfate level**

- **<u>Antidote for Mg sulfate toxicity:</u>**

1. **Calcium gluconate** 1 g IV over 3 minutes. Repeat doses may be necessary.
2. **Calcium chloride** can also be used in lieu of calcium gluconate. The suggested dose for calcium chloride for magnesium toxicity is 500 mg of 10% calcium chloride IV given over 5-10 minutes.
3. **Dialysis** is a recommended treatment for people with impaired kidney function

HELLP Syndrome

- **Hemolysis characterized by** increased LDH (> 600 U/L), AST (≥ 70 U/L), an elevated reticulocyte count, elevated unconjugated bilirubin, and decreased Haptoglobin.
- The presence of schistocytes (fragmented red blood cells) on the peripheral blood smear suggests red blood cell injury (microangiopathic hemolytic anemia)
- **Thrombocytopenia**
- **Elevated liver function tests**

HELLP Syndrome

- The syndrome has been associated with particularly high maternal and perinatal morbidity and mortality rates and may be present without hypertension or, in some cases, without proteinuria.

Prevention of Pre-eclampsia

- **The rate of preeclampsia is not reduced by:**
- Bed rest
- Restriction of physical activity
- Restriction of salt intake
- Supplementation with magnesium, zinc, folate, vitamins C, D and E or fish oil.

Prevention of preeclampsia

- **ASPRE trial**: Use of Aspirin was associated with a 62% reduction in the incidence of preterm PET and 82% reduction in the incidence of PET at <34 weeks' gestation.
- Dietary calcium supplementation of at least 1 g daily from mid-pregnancy in women with low calcium diets may halve the rate of PET.
- Preliminary data suggest that prophylactic use of pravastatins may also benefit women at high-risk of PET as well as potentially lowering risk of IUGR, Preterm birth, and NICU admission in neonates.

References

- The management of hypertensive disorders during pregnancy depending on:
- NICE Guidelines
- (NICE) **[2010, amended 2019]**