Hypertension in Pregnancy

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DEFINITIONS

- *Hypertension:* Blood pressure of 140 mmHg systolic or higher, or 90 mmHg diastolic or higher [NICE 2019]
- *Chronic hypertension* Hypertension that is present at the booking visit, or before 20 weeks, or if the woman is already taking antihypertensive medication when referred to maternity services. It can be primary or secondary in etiology.
- *Eclampsia:* A convulsive condition associated with pre-eclampsia.
- *Gestational hypertension :* New hypertension presenting after 20 weeks of pregnancy without significant proteinuria.
- *HELLP syndrome* Hemolysis, elevated liver enzymes and low platelet count.

DEFINITIONS

Pre-eclampsia : New onset of hypertension (over 140 mmHg systolic or over 90 mmHg diastolic) after 20 weeks of pregnancy and the coexistence of 1 or more of the following new-onset conditions:

A- proteinuria (urine protein/creatinine ratio of 30 mg/mmol or more or or albumin/creatinine ratio of 8 mg/mmol or more, or o at least 1 g/litre [2+] on dipstick testing) or ;

B- **other maternal organ dysfunction:**

1— renal insufficiency (creatinine 90 micromol/litre or more, 1.02 mg/100 ml or more)

2— liver involvement (elevated transaminases [alanine aminotransferase or aspartate aminotransferase over 40 IU/litre] with or without right upper quadrant or epigastric abdominal pain)

3— neurological complications such as eclampsia, altered mental status, blindness, stroke, clonus, severe headaches or persistent visual scotomata

4— haematological complications such as thrombocytopenia (platelet count below 150,000/ microlitre), disseminated intravascular coagulation or hemolysis

C-Uteroplacental dysfunction such as fetal growth restriction, abnormal umbilical artery doppler waveform analysis, or stillbirth.

DEFINITIONS

- *Severe hypertension :* Blood pressure over 160 mmHg systolic or over 110 mmHg diastolic.
- *Severe pre-eclampsia:* Pre-eclampsia with severe hypertension that does not respond to treatment or is *associated with* ongoing or recurring severe headaches, visual scotomata, nausea or vomiting, epigastric pain, oliguria, 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.

Chronic Hypertension

"Preexisting Hypertension"

Definition:

-Systolic pressure ≥ 140 mmHg, diastolic pressure ≥90 mmHg, or both.

- Presents before 20th week of pregnancy or persists longer then 12 weeks postpartum.

Causes

Primary = "Essential Hypertension"

Secondary = Result of other medical condition (ie: renal disease)

Prenatal Care for Chronic Hypertension

- Electrocardiogram should be obtained in women with long-standing hypertension.
- Baseline laboratory tests:

-Urinalysis, urine culture, and serum creatinine, glucose, and electrolytes

-Tests will rule out renal disease, and identify comorbidities such as diabetes mellitus.

-Women with proteinuria on a urine dipstick should have a quantitative test for urine protein.

Treatment for Chronic Hypertension

- Avoid treatment in women with uncomplicated mild essential HTN as blood pressure may decrease as pregnancy progresses.
- May taper or discontinue meds for women with blood pressures less than 120/80 in 1st trimester.
- Reinstitute or initiate therapy for persistent diastolic pressures >95 mmHg, systolic pressures >150 mmHg, or signs of hypertensive end-organ damage.
- Medication choices = Oral methyldopa and labetalol.

Preeclampsia

- Definition = see before slide #3
- Preeclampsia before 20 weeks, think MOLAR PREGNANCY!
- Categories
  - Mild Preeclampsia
  - Severe Preeclampsia.
- Eclampsia
  - Occurrence of generalized convulsion and/or coma in the setting of preeclampsia, with no other neurological condition.

Preeclampsia

Severe Preeclampsia must have one of the following:

1. Symptoms of central nervous system dysfunction = Blurred vision, scotomata, altered mental status, severe headache
2. Symptoms of liver capsule distention = Right upper quadrant or epigastric pain
3. Nausea, vomiting
4. Hepatocellular injury = Serum transaminase concentration at least twice normal
5. Systolic blood pressure ≥160 mm Hg or diastolic ≥110 mm Hg on two occasions at least six hours apart
6. Thrombocytopenia = <100,000 platelets /mm3
7. Proteinuria = 5 or more grams in 24 hours
8. Oliguria = <500 mL in 24 hours
9. Severe fetal growth restriction
10. Pulmonary edema or cyanosis
11. Cerebrovascular accident

Summary

- *Severe hypertension :* Blood pressure over 160 mmHg systolic or over 110 mmHg diastolic.
- *Severe pre-eclampsia:* Pre-eclampsia with severe hypertension that does not respond to treatment or is *associated with* ongoing or recurring severe headaches, visual scotomata, nausea or vomiting, epigastric pain, oliguria, 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.

Preeclampsia

Risk factors:

A) Maternal specific:

1) **Age:** < 20 or > 35 years.
2) **Gravidity & parity:** More in primigravidas specially elderly primigravidas.
3) **Race:** More in black races.
4) **Low SES.**
5) **Medical disorders:** Chronic HTN, chronic nephritis or DM.
6) **Obesity.**
7) **Past or family history of hypertensive disorder with pregnancy.**

B) Pregnancy specific:

1) **Vesicular mole.**
2) **Multifetal pregnancy.**
3) **Polyhydramnios.**
4) **Seasonal variation:** More common in winter.

Preeclampsia

- **Etiology:** Preeclampsia is a disease of theories & any theory concerning etiology & pathophysiology of the disease must explain high incidence in women who are:

1) Exposed to trophoblasts for 1st time (primi-gravidas).

2) Exposed to superabundance of trophoblasts (vesicular mole or multifetal pregnancy).

3) With known vascular disease or with genetic predisposition to HTN.

Preeclampsia

Many theories, non is ideal; it may be multifactorial

1- increased pressor response.

2- Abnormal placentation.

3- Genetic predisposition.

4- Immunological factor

5- Inflammatory mediators

6- Others: a) Prostaglandins increased (PGs),

b) Nitric oxide deficiency c) Endothelins-1 excess:, d) Vascular endothelial growth factor (VEGF) increased e) Free radical increase

f) Vitamin E / lipid peroxides imbalance. g) Pro-renin excess,

h) Endothelial cell activation.

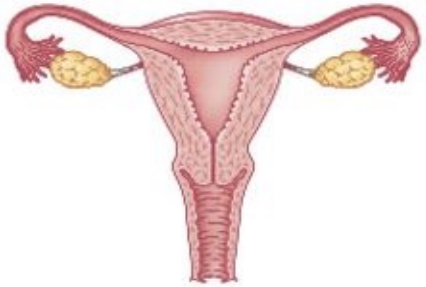
PATHOPHYSIOLOGY

Stage I

Proposed pathways

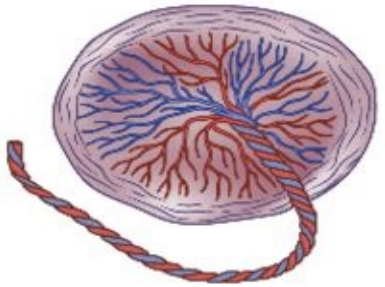
- ↓Nitric oxide
- ↓Heme oxygenase
- AT1-AA
- ↓COMT
- Oxidative stress
- Genetic/environmental immunologic factors

Stage II
Placental ischemia



Abnormal placentation

- ↑sFlt-1/sVEGFR1/sEng
- ↓Circulating VEGF/ PlGF1
- Misfolded placental proteins
- Unknown maternal factors



Inappropriate spiral artery remodeling

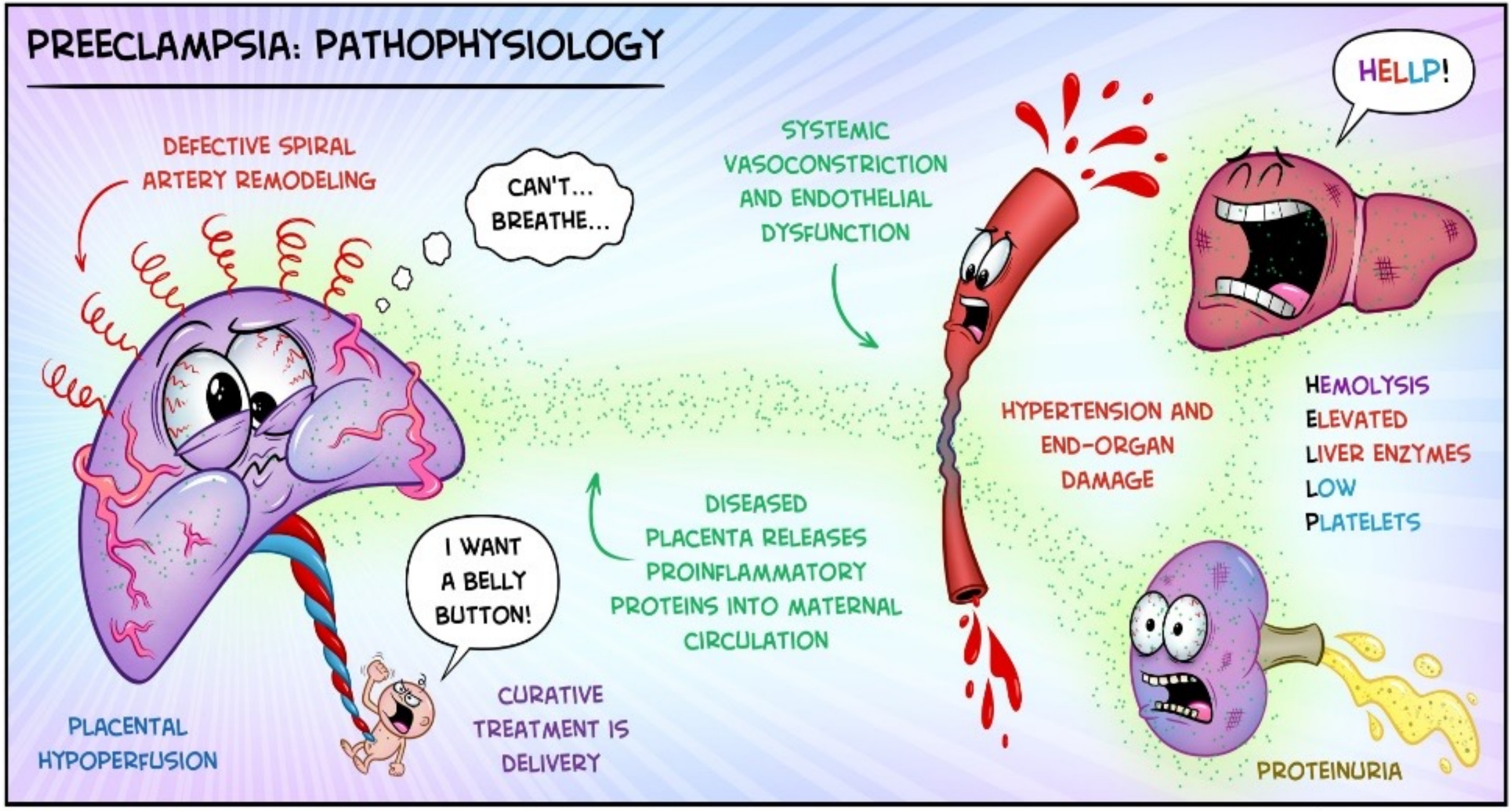
- HTN
- Proteinuria
- AKI

- Capillary leak
- Pulmonary edema

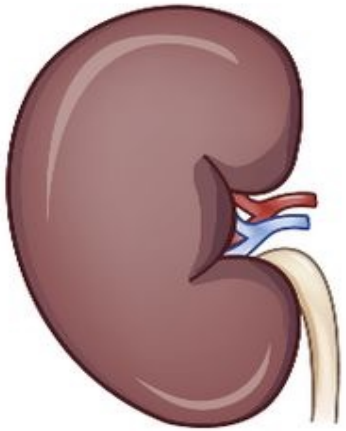
- Headache
- Seizure
- PRES

- ↑LFTs
- Hepatic infarction

- Activated coagulation system
- Thrombocytopenia


PREECLAMPSIA: PATHOPHYSIOLOGY
DEFECTIVE SPIRAL ARTERY REMODELING
CAN'T... BREATHE...
I WANT A BELLY BUTTON!
PLACENTAL HYPOPERFUSION
CURATIVE TREATMENT IS DELIVERY
DISEASED PLACENTA RELEASES PROINFLAMMATORY PROTEINS INTO MATERNAL CIRCULATION
SYSTEMIC VASOCONSTRICTION AND ENDOTHELIAL DYSFUNCTION
HELLP!
HYPERTENSION AND END-ORGAN DAMAGE
HEMOLYSIS
ELEVATED LIVER ENZYMES
LOW PLATELETS
PROTEINURIA

PATHOLOGY OF PE



CKD

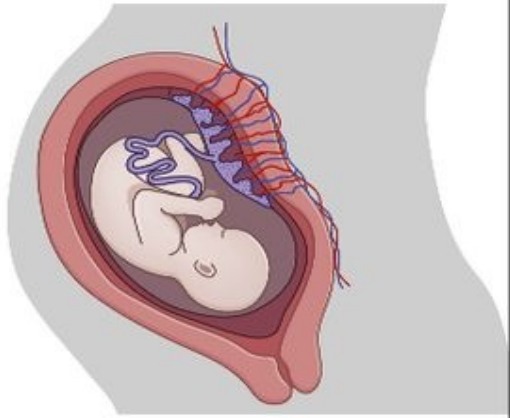
Altered angiogenesis

↑ Renin-angiotensin activity/response

Complement activation

Endothelial dysfunction

Podocyte loss



Pre-eclampsia

Pre-Pregnancy

- Chronic hypertension
- Proteinuria

Pregnancy

- Proteinuria
- Loss of maternal kidney function
- ↑ Risk adverse outcomes:
  - Fetal growth restriction
  - Preterm delivery
  - Birthweight <10th centile
  - Neonatal unit admission

Post-Partum

- Risk of CV disease
- Risk of kidney failure

Preeclampsia

Complications:

1) **Eclampsia**

2) **HELLP syndrome:** serious complication characterized by: a) **H**emolysis: Bilirubin ≥ 1.2 mg/dl. b) **El**evated **L**iver enzymes: SGOT > 70 IU/L. c) **L**ow **P**latelet count: < 100 000/mm^3.

-Should be differentiated from; a) Acute fatty liver in pregnancy. b) Thrombotic thrombocytopenic purpura. c) Hemolytic uremic syndrome. d) Hepatitis (viral or drug induced).

- Maternal mortality: 80-90%.
- Recurrence rate: 5%.

In general Maternal mortality: is 2% in severe preeclampsia & 10% in eclampsia.

***Etiology:* Due to complications (commonest cause is ICH).**

Preeclampsia

Complications ; continued

3) Placental abruption. 4) DIC. 5) ICH: Due to severe HTN.

6) Blindness: Due to retinal detachment & it is reversible.

7) HF & acute pulmonary edema: Treated by immediate IV furosemide .

8) Ruptured sub-capsular hepatic hematoma.

9) Acute renal failure: Acute tubular necrosis or acute cortical necrosis.

10) PPH: In preeclampsia & eclampsia, PPH is diagnosed if there is blood loss > 200 ml (normally, > 500 ml) because there are hypovolemia & hemoconcentration.

Complications ; continued

Remote complications of preeclampsia:

a) Residual HTN: 25%.

b) Residual proteinuria.

c) Recurrence:

Primigravida with mild preeclampsia: No recurrence.

Primigravida with severe preeclampsia: 15-50%.

Multipara with severe preeclampsia or eclampsia: 70%.

FETAL COMPLICATIONS OF PE:

1- Prematurity
2- IUGR
3- Asphyxia & IUFD
4-Perinatal mortality

Preeclampsia superimposed on Chronic Hypertension

- Affects 10-25% of patients with chronic HTN
- Preexisting Hypertension with the following additional signs/symptoms:
  1. New onset proteinuria
  2. Hypertension and proteinuria beginning prior to 20 weeks of gestation.
  3. A sudden increase in blood pressure.
  4. Thrombocytopenia.
  5. Elevated aminotransferases.

Treatment of Preeclampsia

- Definitive Treatment = Delivery
- Major indication for antihypertensive therapy is prevention of stroke.
  → Diastolic pressure ≥105-110 mmHg or systolic pressure ≥160 mmHg
- Choice of drug therapy:
  → Acute – IV labetalol, IV hydralazine, SR Nifedipine
  → Long-term – Oral methyldopa or labetalol

Gestational Hypertension

- Mild hypertension **without** proteinuria or other signs of preeclampsia.
- Develops in late pregnancy, after 20 weeks gestation.
- Resolves by 12 weeks postpartum.
- Can progress onto preeclampsia.
  - Often when hypertension develops <30 weeks gestation.
- Indications for and choice of antihypertensive therapy are the same as for women with preeclampsia.

Risk Factors for Hypertension in Pregnancy

1. Nulliparity
2. Preeclampsia in a previous pregnancy
3. Age >40 years or <18 years
4. Family history of pregnancy-induced hypertension
5. Chronic hypertension
6. Chronic renal disease
7. Antiphospholipid antibody syndrome or inherited thrombophilia
8. Vascular or connective tissue disease
9. Diabetes mellitus (pregestational and gestational)
10. Multifetal gestation
11. High body mass index
12. Male partner whose previous partner had preeclampsia
13. Hydrops fetalis
14. Unexplained fetal growth restriction

Evaluation of Hypertension in Pregnancy

History

1. ID and Complaint
2. HPI (S/S of Preeclampsia)
3. Past Medical Hx, Past Family Hx
4. Past Obstetrical Hx, Past Gyne Hx
5. Social Hx
6. Medications, Allergies
7. Prenatal serology, blood work
8. Assess for Hypertension in Pregnancy risk factors

Physical

1. Vitals
2. HEENT = Vision
3. Cardiovascular
4. Respiratory
5. Abdominal = Epigastric pain, RUQ pain
6. Neuromuscular and Extremities = Reflex, Clonus, Edema
7. Fetus = Grips, FM, NST

Evaluation of Hypertension in Pregnancy

- Laboratory Tests
  1. CBC (Hgb, Plts)
  2. Renal Function (Cr, UA, Albumin)
  3. Liver Function (AST, ALT, ALP, LD)
  4. Coagulation (PT, PTT, INR, Fibrinogen)
  5. Urine Protein (Dipstick, 24 hour)

Management of Hypertension in Pregnancy

- Depends on severity of hypertension and gestational age!

- **Observational Management**
  - Restricted activity
  - Close Maternal and Fetal Monitoring
    1. BP Monitoring
    2. S/S of preeclampsia
    3. Fetal growth and well being (NST, and U/S)
  - Routine weekly or biweekly blood work

Management of Hypertension in Pregnancy

- **Medical Management**
  1. Acute Therapy = IV Labetalol, IV Hydralazine, SR Nifedipine
  2. Expectant Therapy = Oral Labetalol, Methyldopa, Nifedipine
  3. Eclampsia prevention = MgSO4

- **Contraindicated antihypertensive drugs**
  1. **ACE inhibitors** (angiotensin-inhibiting-enzyme inhibitors)
  2. **Angiotensin receptor antagonists**

Management of Hypertension in Pregnancy

- **Proceed with Delivery**
  - Vaginal Delivery VS Cesarean Section
  - Depends on severity of hypertension!
  - May need to administer antenatal corticosteroids depending on gestation!

- **Only cure is DELIVERY!!!**

THANKS

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