Hypertensive Disorders in Pregnancy

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Chronic Hypertension

Chronic hypertension is defined as hypertension present before pregnancy or before the 20th week of gestation or that persists longer than the postpartum period (i.e., 12 weeks after delivery).

Criteria for chronic hypertension in pregnancy are as follows:

- Mild-Moderate: Systolic pressure of 140–159 mmHg or diastolic pressure of 90–109 mmHg
- Severe: Systolic pressure of 160 mmHg or greater or diastolic pressure of 110 mmHg or greater

Risk Factors for Preeclampsia

- Nulliparity
- Multifetal gestation
- Maternal age 40 years or older
- Preeclampsia in a previous pregnancy
- Chronic hypertension
- Pregestational diabetes
- Vascular and connective tissue disorders
- Nephropathy and other chronic renal disease
- Antiphospholipid syndrome
- Obesity
- African American race
- In vitro fertilization

Gestational Hypertension

Hypertension that develops for the first time after 20 weeks of gestation in the absence of proteinuria.

Gestational hypertension develops in 5% to 10% of pregnancies, with a 30% incidence in multiple gestations, regardless of parity.

Almost 50% of women with gestational hypertension go on to develop preeclampsia, and approximately 10% of eclamptic seizures occur before overt proteinuria develops.

Gestational hypertension is considered transient hypertension if blood pressure returns to normal before 12 weeks postpartum or reclassified as chronic hypertension if it persists.

Preeclampsia

Preeclampsia is the development of hypertension with proteinuria after 20 weeks of gestation.

The criteria for the diagnosis of preeclampsia are as follows:

- Blood pressure of ≥140 mmHg systolic or ≥90 mmHg diastolic that occurs after 20 weeks of gestation
- Proteinuria, defined as urinary excretion of 0.3 g protein or higher in a 24-hour urine specimen

prevention

- Dietary and life style modifications
- Calcium supplementation
- Cardioprotective fatty acids
- Antihypertensive drugs
- Antithrombotic agents

- Severe preeclampsia is characterized by one or more of the following:
  - Blood pressure ≥160 mmHg systolic or ≥110 mmHg diastolic on two occasions at least 4 hours apart while the patient is on bed rest (severely elevated blood pressure that persists beyond 15 minutes should be treated.
  - Progressive renal insufficiency (serum creatinine >1.1 mg/dl or doubling of serum creatinine)
  - Cerebral or visual disturbances such as headache and scotomata
  - Pulmonary edema
  - Epigastric or right-upper-quadrant (RUQ) pain (probably caused by subcapsular hepatic hemorrhage or stretching of Glisson capsule with hepatocellular edema)
  - Evidence of hepatic dysfunction (elevated serum transaminase levels more than two times normal)
  - Thrombocytopenia (platelet count <100,000/microliter)

Eclampsia

Eclampsia is the additional presence of convulsions (grand mal or tonic–clonic seizures) in a woman with preeclampsia that is not explained by a neurologic disorder.

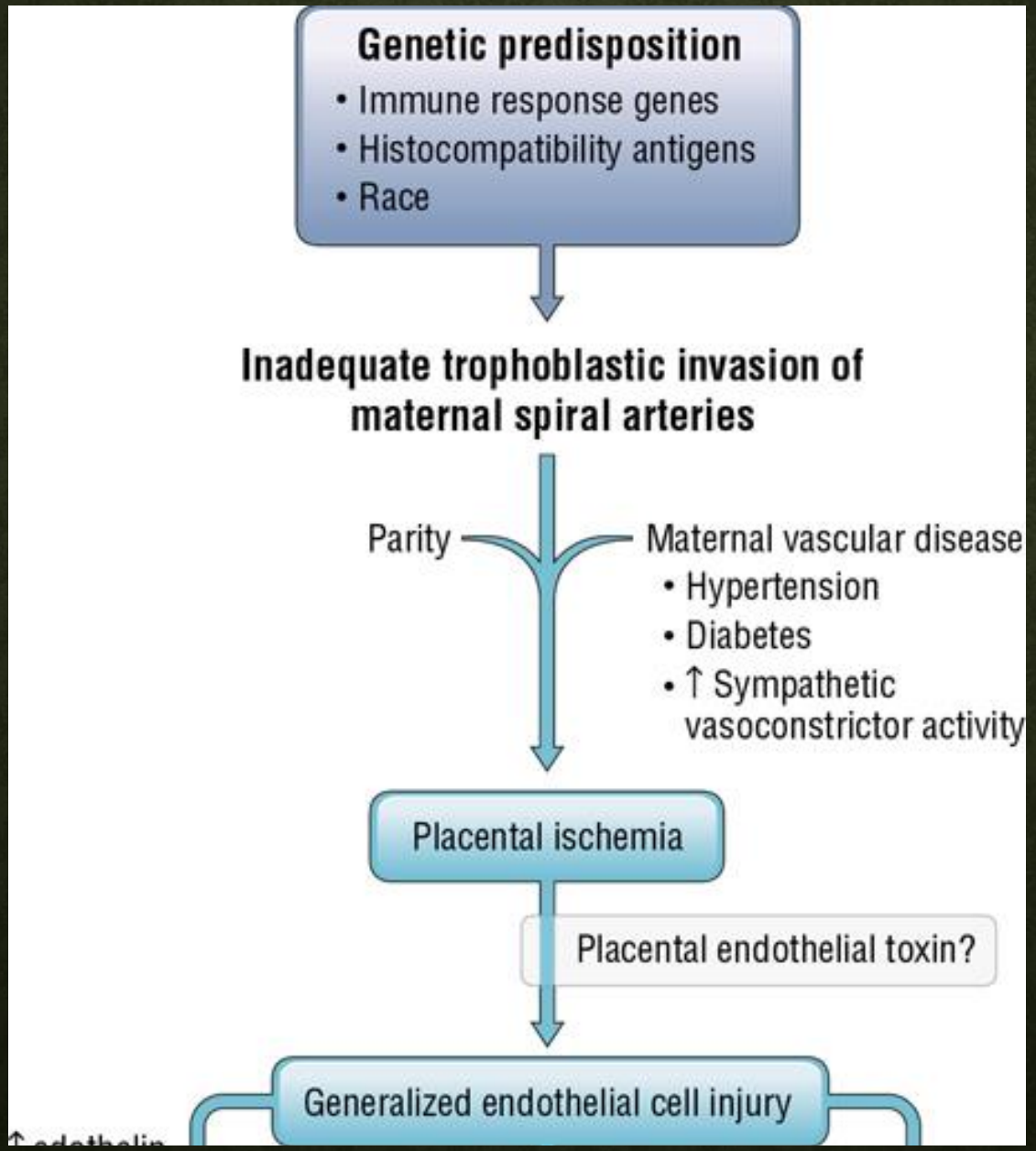
Eclampsia occurs in 0.5% to 4% of patients with preeclampsia. Most cases of eclampsia occur prior to or within 24 hours of delivery, but up to 10% of cases are diagnosed between 2 and 10 days postpartum.

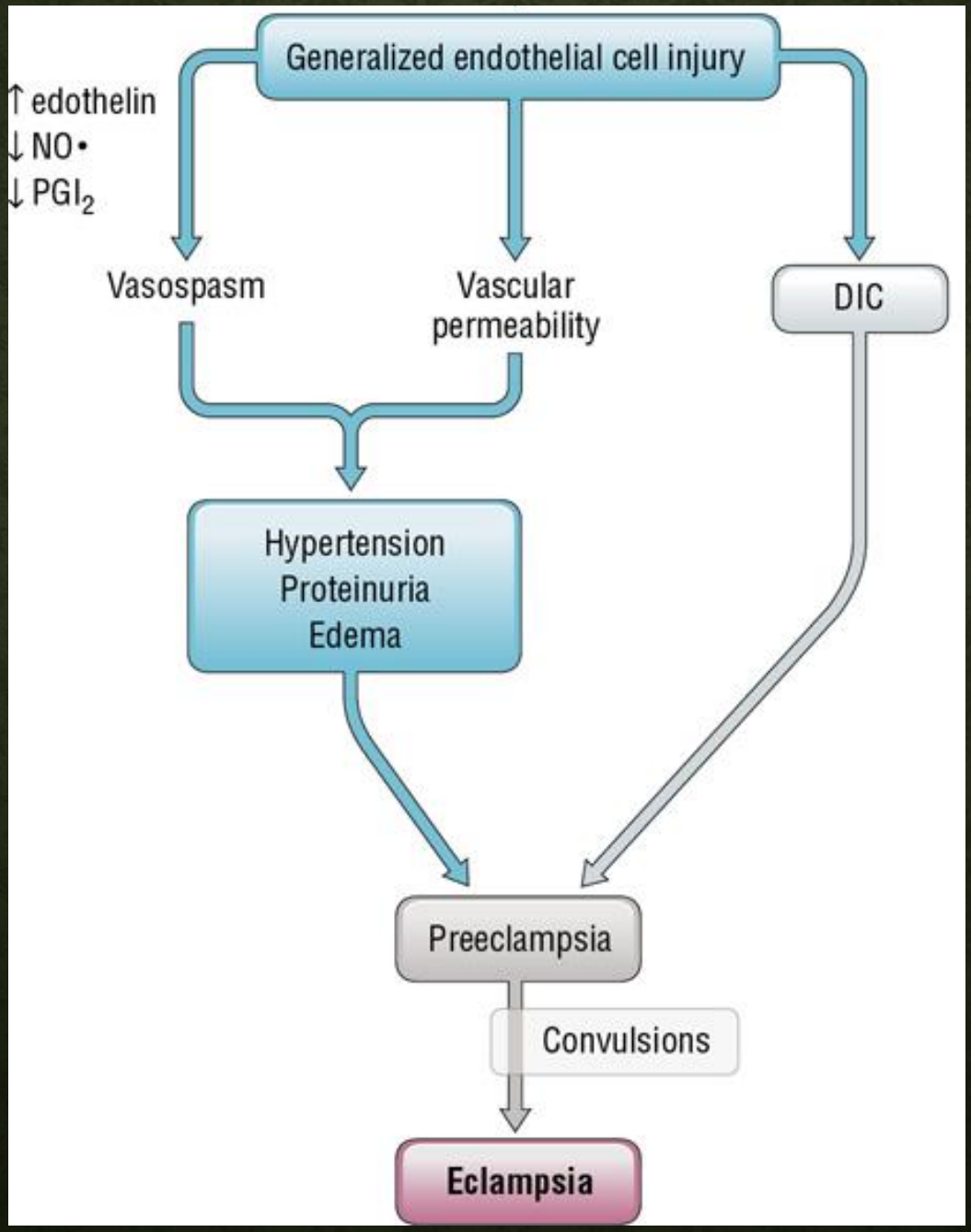
HELLP Syndrome

HELLP syndrome is the presence of hemolysis, elevated liver enzymes, and low platelet count.

HELLP syndrome is an indication for delivery to avoid jeopardizing the health of the woman.

Women with HELLP syndrome who are less than 34 0/7 weeks gestational age should receive corticosteroids for fetal benefit. If maternal labs do not continue to worsen or the fetal status does not deteriorate, then an attempt to delay delivery for 24 to 48 hours to complete the corticosteroid course is reasonable.


Genetic predisposition
• Immune response genes
• Histocompatibility antigens
• Race
Inadequate trophoblastic invasion of maternal spiral arteries
Parity
Maternal vascular disease
• Hypertension
• Diabetes
• ↑ Sympathetic vasoconstrictor activity
Placental ischemia
Placental endothelial toxin?
Generalized endothelial cell injury


Generalized endothelial cell injury
↑ edothelin
↓ NO•
↓ PGI_2
Vasospasm
Vascular permeability
DIC
Hypertension
Proteinuria
Edema
Preeclampsia
Convulsions
Eclampsia

Effects on Organ Systems and Fetus

- Cardiovascular effects: Elevated blood pressure is seen as the result of potential vasoconstriction as well as an increase in cardiac output.

- Hematologic effects:

Plasma volume contraction or hemoconcentration may develop, with the risk of rapid onset hypovolemic shock, if hemorrhage occurs.

Plasma volume contraction is reflected in increased hematocrit values.

Thrombocytopenia or disseminated intravascular coagulation may also develop from microangiopathic hemolytic anemia.

Involvement of the liver may lead to hepatocellular dysfunction and further evolution of coagulopathy.

Third spacing of fluid may be noted, because of increased blood pressure and decreased plasma oncotic pressure.

- Renal effects:

Decreased glomerular filtration rate (increasing serum creatinine) and proteinuria (urine protein levels >300 mg per 24 hours) develop secondary to vasospasm and atherosclerotic-like changes in the renal vessels (glomerular endotheliosis).

Uric acid filtration is decreased; therefore, elevated maternal serum uric acid levels may be an indication of evolving disease.

- Neurologic effects:

Hyperreflexia/hypersensitivity may develop.
Other neurologic manifestations include headache, blurred vision, and scotomata.
In severe cases, grand mal (eclamptic) seizures may develop.

- **Pulmonary effects:**

Pulmonary edema may occur and can be related to decreased colloid oncotic pressure, pulmonary capillary leak, left heart failure, iatrogenic fluid overload, or a combination of these factors.

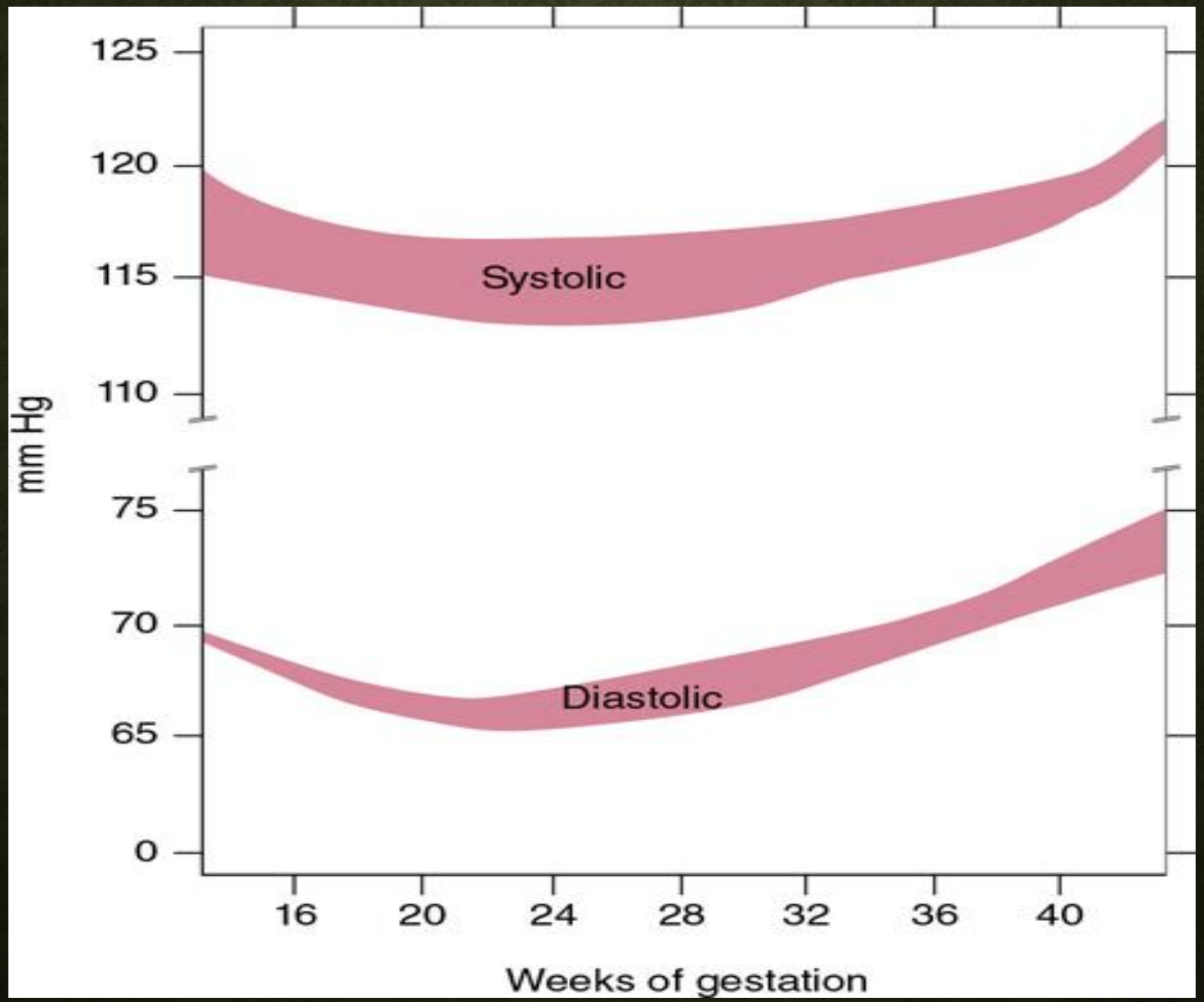
- Fetal effects:

Decreased intermittent placental perfusion secondary to vasospasm is thought to be responsible for the increased incidence of IUGR (<10% estimated fetal weight for gestational age) and oligohydramnios and increased perinatal mortality.

An increased incidence of placental abruption is also seen.

Physical Examination

- The position of the patient influences blood pressure.
- The choice of the correct-size blood pressure cuff also influences blood pressure readings, with falsely high measurements noted when normalsized cuffs are used on large patients.
- during the course of pregnancy, blood pressure typically declines slightly in the second trimester, increasing to prepregnant levels as gestation nears term.


125
120
115
110
Systolic
mm Hg
75
70
65
0
Diastolic
16
20
24
28
32
36
40
Weeks of gestation

Maternal studies

Complete blood count
Platelet count
Coagulation profile (PT, PTT)
Liver function studies
Serum creatinine
Uric acid
24-hour urine
Creatinine clearance
Total urinary protein

Fetal studies

Ultrasound examination
Fetal weight and growth
Amniotic fluid volume
Nonstress test and/or biophysical profile

Chronic Hypertension

The management of patients with chronic hypertension in pregnancy involves;

- closely monitoring maternal blood pressure and watching for the superimposition of preeclampsia or eclampsia
- following the fetus for appropriate growth and fetal well-being.

Antihypertensive medication in women with chronic hypertension is generally recommended when the systolic blood pressure is ≥160 mmHg or the diastolic blood pressure ≥105 mmHg.

The purpose of such medications is to reduce the likelihood of maternal stroke or major cardiac events.

- Labetalol (combined α- and β-blocker) is first-line
- calcium channel blockers
- Methyldopa
- It was formerly taught that diuretics were contraindicated during pregnancy, but diuretic therapy is no longer discontinued and, indeed, is often continued in the patient who already has been on such therapy before becoming pregnant.
- Angiotensin-converting enzyme (ACE) inhibitors and Angiotensin receptor blockers are not recommended in pregnancy or the preconception period.

Preeclampsia

The severity of the preeclampsia and the maturity of the fetus are the primary considerations in the management of preeclampsia.

Preeclampsia diagnosed at term and beyond is generally an indication for delivery.

Management for patients with preeclampsia and no severe features;

rest and frequent monitoring of mother and fetus

weekly laboratory testing

twice-weekly NSTs, BPPs

Ultrasound examination for fetal growth and amniotic fluid assessment (every 3 w)

Daily fetal movement assessment

Preeclampsia with Severe Features

✓ Stabilization with magnesium sulfate, antihypertensive therapy

✓ monitoring for maternal and fetal well-being

✓ Administration of corticosteroids for fetal lung maturation is recommended if less than 37 weeks' gestation.

✓ Patients with the diagnosis of preeclampsia with severe features should be delivered if ≥34 weeks' gestation.

Delivery by either induction or cesarean delivery should not be delayed, even if less than 34 weeks' gestation, if any of the following are noted:

- uncontrollable severe hypertension,
- eclampsia,
- pulmonary edema,
- abruptio placentae,
- disseminated intravascular coagulation,
- Evidence of nonreassuring fetal status,
- intrapartum fetal demise,
- nonviable fetus.

- For almost a century, **magnesium sulfate** has been used to prevent and to treat eclamptic convulsions.

- Other anticonvulsants, such as diazepam and phenytoin, are rarely used because they are not as efficacious as magnesium and because they have potential adverse effects on the fetus.

- Magnesium sulfate is administered by intramuscular or intravenous (IV) routes.

- In 98% of cases, convulsions will be prevented. Therapeutic levels are 4 to 6 mg/dL, with toxic concentrations having predictable consequences

Frequent evaluations of the patient's patellar reflex and respirations are necessary to monitor for manifestations of rising serum magnesium concentrations. because magnesium sulfate is excreted solely from the kidney, careful attention for signs of magnesium toxicity is warranted in the setting of reduced urine output (<30 mL/hour) or diminished renal function (serum creatinine >1.0 mg/mL).

In these situations, serum magnesium levels may be useful in adjusting the infusion rate and avoiding toxicity.

Reversal of the effects of excessive magnesium concentrations is accomplished by the slow IV administration of 10% calcium gluconate, along with oxygen supplementation and cardiorespiratory support, if needed.

Antihypertensive therapy is initiated if, on repeated measurements, the systolic blood pressure is >160 mmHg or diastolic blood pressure exceeds 110 mmHg.

The goal of such therapy is to reduce the systolic and diastolic pressure to the 140- to 150-/90- to 100-mmHg range.

Hydralazine
Nifedipine
Diuretics
Labetalol

Fluid therapy

At delivery, blood loss must be closely monitored, because patients with preeclampsia or eclampsia have significantly reduced intravascular volumes and may not tolerate increased blood loss.

After delivery, patients remain in the labor and delivery or antepartum highrisk area for 24 hours for close observation of their clinical progress and further administration of magnesium sulfate to prevent postpartum eclamptic seizures.

Approximately 25% of eclamptic seizures occur before labor, 50% occur during labor, and 25% occur in the first 24 hours after delivery.

The eclamptic seizure

is life-threatening for the mother and fetus
Maternal risks include; musculoskeletal injury, hypoxia, aspiration.

Maternal therapy consists of inserting a padded tongue blade, restraining gently as needed, providing oxygen, assuring maintenance of an adequate airway, and gaining IV access.

Eclamptic seizures are usually self-limited, so medical therapy should be directed at the initiation of magnesium therapy (4 to 6 g slowly, IV) to prevent further seizures.

Transient uterine hyperactivity for up to 15 minutes is associated with fetal heart rate changes, including bradycardia or compensatory tachycardia, decreased variability, and late decelerations.

These are self-limited and are not dangerous to the fetus unless they continue for 20 minutes or more.

Delivery during this time of maternal stabilization imposes unnecessary risk for mother and should be avoided.

Arterial blood gases are often obtained, any metabolic disturbance should be corrected, and a Foley catheter should be placed to monitor urinary output.

If the maternal blood pressure is high, if maternal urinary output is low, or if there is evidence of cardiac disturbance, consideration of a central venous catheter and, perhaps, continuous electrocardiogram monitoring is appropriate.

Delivery is indicated once the mother is stabilized.

Persistent severe post partum hypertension

- IV drugs
- Beta blockers
- Calcium channel blockers
- Diuretics
- Methyl dopa
- NSAIDs

HELLP Syndrome

Patients with HELLP syndrome are often multiparous and have blood pressure recordings lower than those of many preeclamptic patients.

The first symptoms are often vague, including nausea and emesis and a nonspecific viral-like syndrome.

Treatment of these ill patients is best done in a high-risk obstetric center and consists of cardiovascular stabilization, correction of coagulation abnormalities, and delivery.

Platelet transfusion before or after delivery is indicated if the platelet count is <20,000/mm3, and it may be advisable to transfuse patients with a platelet count <50,000/mm3 before proceeding with a cesarean birth.

Management of cases of HELLP syndrome should be individualized based on gestational age at presentation, maternal symptoms, physical examination, laboratory findings, and fetal status.

Delivery should not be delayed.

In pregnancies less than 34 weeks' gestation, an attempt to administer 48 hours of corticosteroids for fetal benefit may be considered with frequent laboratory, maternal and fetal assessment.

Worsening status should prompt delivery regardless of corticosteroid course and gestational age.