

CHAPTER 9

HYPERTENSION IN PREGNANCY

Learning Objectives

By the end of this chapter, the participant will:

1. Classify hypertension in pregnancy.
2. Identify the appropriate monitoring and management of gestational hypertension.
3. Discuss how to determine the appropriate medication according to the condition of the woman.

Introduction

Hypertensive disorders in pregnancy are one of the leading causes of maternal death in developing countries.

All health care providers must be able to promptly recognize the signs, symptoms, and laboratory findings related to hypertension in pregnancy, with or without proteinuria, and with other adverse manifestations. Health care providers must appreciate fully the seriousness of hypertension in pregnancy, its potential for multi-organ involvement, and the risks for perinatal and maternal morbidity and mortality.

The appropriate management of hypertension in pregnancy may vary, based on the availability of resources. The roles for rural and remote health care providers may be quite different when factors such as geography, weather, and access to specialists or tertiary care centres are considered. Health care providers may be faced with emergency situations such as stabilizing or treating pregnant women with hypertension. The management of hypertension with proteinuria and other adverse manifestations is relevant to all maternity health care providers.

Risk Factors for Gestational Hypertension

Gestational hypertension occurs more frequently in nulliparous women but it may also occur in multiparous women. Women who are at particularly increased risk are those with

- Pre-existing hypertension
- Renal (kidney) disease
- Diabetes mellitus
- Women carrying a first pregnancy conceived with a new partner
- Women with multiple pregnancy
- Obesity
- Extremes of reproductive age (very young or women over age 35)
- Black race

Clinical features to watch for during a current pregnancy that are associated with an increased chance of developing subsequent gestational hypertension are:

- No mid-trimester fall in systolic and diastolic blood pressure (BP)
- Excessive weight gain (>1 kg or 2 lbs per week)
- Finger or facial oedema

Classifications and Definitions of Hypertensive Disorders in Pregnancy

Women may experience hypertension in pregnancy, with or without proteinuria, and with or without adverse manifestations. There are many classifications in the world for hypertensive disorders in pregnancy. Therefore, the current diagnostic classification of hypertension in pregnancy is useful to review.

Classifications

1. Pre-existing hypertension (chronic hypertension) is present before 20 weeks gestation
 - Essential
 - Secondary
2. Gestational hypertension occurs after 20 weeks gestation, in labour or within 48 hours of delivery
 - Without proteinuria (pregnancy-induced hypertension, transient hypertension, non-proteinuric gestational hypertension)
 - without adverse conditions
 - with adverse conditions (severe preeclampsia, eclampsia)
 - With proteinuria (pregnancy-induced hypertension, preeclampsia, toxemia)
 - without adverse conditions
 - with adverse conditions (severe preeclampsia, eclampsia)
3. Pre-existing hypertension with superimposed gestational hypertension with proteinuria (chronic hypertension with super-imposed preeclampsia)
4. Unclassifiable antenatally

Definitions

Hypertension

- Diastolic BP of ≥ 90 mm Hg on 2 measurements > 5 minutes apart after a period of 10 minutes rest
- Diastolic BP ≥ 110 mm Hg on a single measurement

Blood pressure should be determined

- In the sitting position with the arm at heart level
- Using the appropriate cuff size (obese women require a larger size cuff for an accurate reading)
- Using an accurate mercury sphygmomanometer
- Through repeat BP measurements in ≥ 4 hours intervals unless BP is very high (diastolic ≥ 110 mmHg)

An absolute systolic or diastolic BP reading is the preferred criterion rather than an incremental rise of $\geq 30/15$ mmHg in systole/diastole, although this observation may have clinical significance.

Proteinuria

- Urine protein $\geq 2+$ on dipstick
- Urine protein ≥ 300 mg/L on 24-hour collection
- Proteinuria indicates glomerular dysfunction
- 24-hour urine should be considered if urine protein $\geq 1+$ on dipstick

Oedema

- Generalized oedema is no longer part of the diagnosis of gestational hypertension. Non-dependent oedema of the face and fingers may alert the health care provider to further assess the woman, because it is associated with an increased chance of developing subsequent gestational hypertension

Manifestations of Severity

The criteria for gestational hypertension with or without proteinuria and with adverse conditions are hypertension plus any of the following findings:

- Diastolic BP ≥ 110 mmHg
- Platelets $< 100,000$ /mm
- Oliguria < 500 mL/d
- Proteinuria > 3 g/d

- Elevated uric acid
- Elevated liver enzymes
- Hemolysis, elevated liver enzymes and low platelets (HELLP syndrome)
- Pulmonary oedema
- Convulsions (eclampsia)
- Severe nausea and vomiting
- Right upper quadrant and epigastric pain
- Frontal headache
- Visual disturbance
- Abruptio placenta
- Disseminated intravascular coagulation

The appearance of any of these manifestations of multi-organ involvement or the development of gestational hypertension remote from term constitutes an obstetrical emergency. This emergency may need to be managed in conjunction with other consultants (including haematological, neonatal, nursing, and obstetric experts) with access to a laboratory, blood bank, pharmacy, and hospital facilities. Health care providers who lack ready access to many of these resources should develop protocols for their health care settings for the rare emergent case that cannot be transferred to a high-risk care centre.

Management and Treatment of Gestational Hypertension

Management

The initial evaluation of a woman with gestational hypertension involves assessment symptoms, physical condition, and laboratory findings as well as assessment of the fetus.

Clinical assessment

Right upper quadrant pain, headache, and visual disturbances are potentially ominous symptoms requiring immediate assessment.

Measure BP adequately

- Record the BP in the sitting position, using an appropriately sized cuff
- Be consistent in measuring BP, use the same arm for each reading

Cardiorespiratory

- Chest pain
- Dyspnea
- Distended neck veins

Central Nervous System

- Presence and severity of headache
- Visual disturbance/blurring, scotomata
- Tremulousness, irritability, somnolence
- Hyperreflexia

Haematologic

- Bleeding, petechiae

Hepatic

- Right upper quadrant and epigastric pain
- Severe nausea and vomiting

Renal

- Urine output and colour

Non-dependent oedema (i.e. face and fingers)

Laboratory assessment

Where resources are available, the following tests should be done:

Hematologic

- Hemoglobin, platelets, blood film
- Partial thromboplastin time (PTT), prothrombin time (PT/INR), fibrinogen and (FDP)

Hepatic

- Liver panel or profile including ALT, AST, LDH, and TBIL¹
- Glucose and ammonia may be tested to rule out acute fatty liver of pregnancy

Renal

- Proteinuria
- Creatinine, urea, uric acid
- 24-hour urine collection for total protein and creatinine clearance and protein creatinine ratio

Assessment of the Fetus

Minimal assessment of the fetus includes documentation of fetal movements, auscultation of the fetal heart rate, and measurement of the fundal height.

Additional studies may include:

- Electronic fetal heart-rate monitoring, including a non-stress test
- Ultrasound to
 - assess growth
 - measure amniotic fluid volume
 - perform a biophysical profile²
 - perform umbilical Doppler flow studies

Treatment**Management goals**

- Prevention of adverse maternal outcomes such as organ damage, convulsions, cerebral vascular accidents (stroke), or death
- Prevention of adverse fetal complications including placental abruption, growth restriction, or stillbirth
- Symptomatic support

¹ These values are part of a standard liver profile or panel: ALT, alanine transaminase; AST, aspartate transaminase; LDH, lactate dehydrogenase, and TBIL, total bilirubin.

² The biophysical profile uses ultrasonography to measure fetal breathing, fetal movement, fetal tone, and amniotic fluid volume. A non-stress test is done to assess fetal heart rate. Each of these five variables is given a score (zero, one, or two) for a potential total score of 10. It is a tool used near or at term by clinicians to assess the potential risk of fetal compromise or demise due to fetal hypoxia or acidosis. Interventions such as maternal hospitalization or delivery may follow a score of four or below, although this may vary between health care facilities.

Delivery is the definitive treatment for gestational hypertension. Expectant management is potentially harmful in the presence of severe gestational hypertension, especially when the fetus has reached maturity or when there is suspected fetal compromise.

Symptom Management

Immediate treatment should include managing symptoms such as nausea and vomiting with an antiemetic to minimize maternal discomfort. Maternal pain (right upper quadrant, headache, etc.) should be managed appropriately. Stress reduction may be helpful because maternal hypertension may be adrenergic.

Stress reduction

Attempt to reduce stress for the woman through:

- Quiet, dim environment
- Clear explanation of the management plan to her and her family
- Minimizing negative stimuli
- Consistent, confident team approach

Ideally, the woman should be cared for a quiet, single room. She must never be left alone, because she could begin having seizures at any time, and inhale secretions or vomit and/or sustain serious injuries. Anaesthetic instruments including suction apparatus and oxygen equipment must be ready for use by the bedside.

The decision to begin administration of antihypertensives may vary from one centre to another because clear evidence is lacking about the benefit of medicating women whose diastolic values are in the range of 95 to 105.

The use of antihypertensives reduces the risk of cardiovascular accident in the woman but does not necessarily reduce the risk of seizures (eclampsia) or prevent adverse fetal outcomes such as intrauterine growth restriction or placental abruption.

Begin antihypertensives when:

- Diastolic BP \geq 110 mm Hg
- OR
- Diastolic BP is 95 to 109 with other adverse symptoms

Antihypertensive agents used can be divided into those used for acute and ongoing therapy.

Acute therapy

Uncontrolled hypertension represents an obstetrical emergency that places the woman at risk for obstetrical hemorrhage, intracerebral hemorrhage and death. Management includes immediate intensive medical treatment with intravenous therapy and maternal/fetal monitoring. It is recommended that all health care facilities have a management plan (protocol) for the treatment of acute severe hypertension. Avoid overzealous correction of BP with antihypertensive medications. Hypotension may cause the placenta to be inadequately perfused and fetal compromise may result. Effective antihypertensive agents should be on the essential drug list in every country. All of these agents are considered first line agents for treatment of severe hypertension in pregnancy:

Labetalol (Trandate®, Normodyne ®)

- Combined alpha-1 and β -blocker with intrinsic sympathetic activity
- Rapid onset of action with both IV and oral route
- IV route particularly useful for hypertensive crisis

- Dosage:
 - bolus, 10–20 mg IV q10 minutes up to 300 mg,
 - infusion, 1–2 mg/minute, increase by 1 mg q15 minutes to a maximum of 4 mg/minute
- Caution: Asthma
- Side effects: Bradycardia masking of hypoglycaemia, may cause reduced fetal heart-rate variability

Hydralazine (Apresoline®): Trials suggest that hydralazine should not be the first choice agent because of a higher association with more maternal hypotension, cesarean sections, abruptions, maternal oliguria, adverse fetal heart-rate patterns, and low Apgar score at 1 minute.

Direct arteriolar vasodilator

- Intravenous (IV) route: rapid onset therefore useful for hypertensive crisis
- Can be used orally
- Dosage: 5 mg IV test dose, followed by 5–10 mg IV q20 minutes, or infusion of 0.5–10 mg/h
- Caution: May cause unpredictable hypotension with resulting fetal compromise
- Side effects: Flushing, headache and tachycardia

Nifedipine (Adalat-PA®)

- Calcium channel blocker
- Direct relaxation of vascular smooth muscle
- Oral agent
- Dosage:
 - Adalat PA, 10 mg bid, may increase to 40 mg bid
 - Adalat XL, starting dose 30 mg/day, optimal dose in pregnancy unknown
- Caution: Magnesium toxicity has been reported with Adalat and MgSO₄ in combination
- Side effects: Flushing, headache, palpitations, tocolysis

Clonidine: Used to treat mild and moderate hypertension. It is a potent α -2-adrenoceptor central stimulant. Has similar action to methyldopa (centrally acting vasodilator) but acts more rapidly.

- Doses: 150 μ g infused in 10 minutes in normal saline overacts within 20 to 30 minutes. Per os: 0.1 mg to 0.2 mg twice a day (dries mouth).

Caution: Be careful about the possibility of rebound hypertension following abrupt discontinuation

The Cochrane Database states, “There is no evidence to justify a strong preference for any one of the various drugs that are available for treating severe hypertension in pregnancy.” Health care providers should choose the agents with which they are most familiar. **Important: sublingual Adalat should not be used in gestational hypertension.**

Seizures

Prevention of seizures is the next step in stabilizing a woman who has hypertension in pregnancy. Blood pressure is not a reliable predictor of the risk of seizures. There is no benefit to prophylaxis in the absence of proteinuria. Anticonvulsant agents are neither innocuous nor completely effective.

Possible complications associated with seizures:

- Fetal bradycardia (more than 50%).
- Placenta abruptio (10% to 20%).
- Aspiration pneumonia (5% to 10%).
- Cerebral hemorrhage especially in the older woman
- Temporary loss of sight with progressive recovery in inside of a week (10%).
- Coma due to the cerebral edema (5%).
- Psychosis that can last 2 weeks (less than 5%).

Magnesium sulfate ($MgSO_4$) is the agent of choice when seizure prophylaxis is indicated, as well as for seizure termination. In more than 98% of cases, magnesium sulphate will be sufficient to control seizure activity within 1 to 2 hours. Most women will have regained consciousness and be well oriented. Magnesium sulfate should be on the essential drug list in every country.

Studies have shown clearly that magnesium sulfate is superior to phenytoin (Dilantin®) for preventing seizures, and that magnesium sulfate is superior to either diazepam (Valium®) or phenytoin for preventing further seizures after seizures have occurred. Maternal morbidity and mortality is decreased with the use of magnesium sulphate as compared to the use of diazepam or Valium® for cessation (stopping) of seizure activity. There is no difference in perinatal mortality.

Magnesium sulfate

CAUTION: Confirm the concentration of this medication when calculating the dosage.

Loading dose

- Insert IV line and give normal saline or Ringer's lactate 1 L in 6–8 hours (3 ml/minute)
- Give 4 g of magnesium sulphate (20 ml of 20% solution) IV slowly over 20 minutes, followed by 1 to 4 g/hour IV for a total daily (24-hour) dose of 30 to 40 g. The maximum dose should not be exceeded; less should be used if the patient is anuric.
- If unable to give IV, give IM only, give 10 g IM total: give 5 g (10 ml of 50% solution) IM in upper outer quadrant of each buttock with 1 ml of 2% lignocaine in the same syringe. (IM injection of $MgSO_4$ is painful.)

If convulsions recur

- Re-assess how long you have waited; **wait 15 minutes after having administered the first dose, and re-calculate the dosage of the drug administered.** Often dosages have been miscalculated due to differences in concentrations of the drug.
- If the woman continues to have seizures after a 15-minute wait, consider a second dose of magnesium sulfate. Give an additional 2 g of magnesium sulfate (10 ml of 20% solution) IV over 20 minutes.

If convulsions continue, give diazepam

- Give diazepam 10 mg IV. This will disrupt the seizure activity.
- **DO NOT REPEAT THE DOSE OF DIAZEPAM.**
- Use magnesium sulfate for longer-term treatment.

Ongoing care

- Do **NOT** leave the woman in her own
- Help her onto her left side, and protect her from fall or injury, but do not restrain her. Restraining a woman who is having convulsions may injure rather than protect her.
- Consult, refer and prepare for transfer to a hospital setting, unless delivery is imminent
 - Keep the woman on her left side during transport
 - If a convulsion occurs during transport, give magnesium sulphate IM, and protect the woman from fall or injury. Do **NOT** restrain her.

If referral to a higher-level health care facility is lengthy or if the woman is in late labour, continue treatment.

- Continue IV treatment giving 1 to 4 g/hour magnesium sulphate (20 ml of 20% solution) IV for a total daily (24-hour) dose of 30 to 40 g. The maximum dose should not be exceeded.

OR

- Give 5 g of 50 % magnesium sulphate solution IM with 1 ml of 2% lignocaine every 4 hours in alternate buttocks until 24 hours after birth or after last convulsion, whichever is later.
- Monitor urine output: collect urine and measure quantity.

- Before giving the next dose of magnesium sulphate, ensure:
 - Knee jerk reflex is present
 - Urine output is >100 ml/hours
 - Respiratory rate is >16/minute
 - Responsiveness and consciousness
- Do **NOT** give the next dose of magnesium sulphate if any of these signs of overdose are present:
 - Knee jerk reflex is absent
 - Urine output is <100 ml/hours
 - Respiratory rate is < 16/minute
 - Loss of consciousness
- If respiratory depression as occurred, do **NOT** give more magnesium sulphate. Give the antidote: calcium gluconate 1 g IV (10 ml of 10% solution) over 10 minutes.
- Careful monitoring will prevent overdose.
- Record all findings and all drugs given.

CAUTION: Magnesium sulphate may cause profound respiratory depression in the baby. Be prepared for the need to resuscitate the newborn when the mother has received magnesium sulphate in labour

In more than 98% of cases, magnesium sulphate will be sufficient to control seizure activity within 1 to 2 hours. Most women will have regained consciousness and be well oriented. Maternal morbidity and mortality is decreased with the use of magnesium sulphate as compared to the use of diazepam or Valium® for management of seizure activity. There is no difference in perinatal mortality.

Following administration of magnesium sulphate, the majority of women will experience a decrease in BP, and seizure activity will stop. When magnesium sulfate fails to control seizures, further investigation is required. If the pregnant woman does not have other signs of preeclampsia including proteinuria, coagulopathy, and if her liver and kidney functioning is normal, the health care provider should re-evaluate the possible causes of seizure activity. Possible differential diagnoses include:

- Chronic epilepsy
- Encephalitis
- Meningitis
- Cerebral tumor
- Cerebral vascular malformation (aneurysm)
- Secondary cerebral abscesses due to parasitic or fungal infections
- Severe malaria

Transportation

When local resources are limited and maternal and fetal conditions permit, the outcome may be improved by transporting the woman to an appropriate referral centre. Principles to be addressed prior to transport include:

- Stable maternal BP
- Stable fetus
- Seizure prophylaxis, if appropriate
 - Five (5) g magnesium sulfate (10 ml of 50% solution) IM with 1 ml of 2% lignocaine in each buttock is recommended for transportation

Delivery is “The Cure”

Gestational hypertension is a progressive disease; expectant management is potentially harmful in the presence of severe gestational hypertension, and may result in fetal compromise. Timely delivery minimises maternal and neonatal morbidity and mortality. If possible, optimize the maternal status before proceeding with delivery.

- Delay delivery to allow transfer only when maternal and fetal condition permit.
- Delay delivery to gain fetal maturity only in selected cases (e.g. when <34 weeks gestation and in a facility with sufficient resources)

When to deliver

- ≥ 37 weeks with gestational hypertension
- ≥ 34 weeks with severe gestational hypertension
- < 34 weeks with any of:
 - diastolic BP ≥ 110 mm Hg despite the use of appropriate antihypertensive agents
 - laboratory evidence of end-organ involvement despite good BP control
 - decreasing platelets or increasing liver function enzymes
 - severe proteinuria
- Suspected fetal compromise
- Recurring seizures
- When the following symptoms are unresponsive to appropriate therapy:
 - severe headaches or visual disturbance
 - nausea, vomiting, or right upper quadrant and epigastric pain

The method of delivery will depend on the period of gestation and the state of the cervix. Induction may be possible if the cervix is favorable (soft, thin, and beginning to dilate). In some cases, cesarean section surgery will be required. Contraindications for cesarean section may include the presence of coagulopathy, lack availability of safe anaesthesia options, very preterm fetus unlikely to survive, and intrauterine fetal death.

Peripartum (During Labour and Delivery) Management

- Do not reduce BP too low, resulting in decrease uteroplacental perfusion.
- Do not fluid overload.
- A team approach is essential.

Summary of Management of Eclampsia

- Call for HELP from an individual who is culturally appropriate to the community and the family
- REMEMBER ABCs
 - Talk with the woman.
 - Monitor vital signs (pulse, BP, respiration, temperature).
 - Protect her airway.
 - Turn patient on her side to minimize the risk of aspiration if she vomits, but do not restrain her. Restraining a woman who is having convulsions may injure rather than protect her.
- Urgently mobilize all available health care providers.
- Start magnesium sulphate: bolus of 4 g (20 ml of 20% solution) IV slowly over 20 minutes. A protocol for the use of magnesium sulphate should be established and available.
- When seizure stops, administer oxygen by face mask, clear airway as required, assess BP, pulse, respirations, and fetal heart rate frequently until stable.
- Assess for evidence of placental abruption.

Protocols for the use of magnesium sulphate must be established, and immediately available on every labour and delivery unit.

Parameters to include are:

- Preparation of medication
- Assessments required prior to administration
- Administration protocol
- Assessment for side effects
- Management of toxicity
- Documentation

Postpartum Management

Gestational hypertension may worsen following delivery. Careful monitoring should continue for the first 48 hours following delivery. Anticonvulsive therapy should be maintained for 24 hours after delivery or after the last convulsion, whichever occurs last. Antihypertensive therapy should continue until the diastolic BP decreases to <110 mmHg. Ideally, the woman should continue to be cared for in a quiet, dim single room. She should not be left alone until she is stable. Her urinary output should be monitored carefully. Women who have had preeclampsia or eclampsia tend to retain fluid. The kidneys are slow to excrete the extra circulating fluid after delivery. This may lead to a rise in BP. Monitor fluid intake, particularly intake from intravenous fluids. Do NOT fluid overload in the postpartum.

Usual postpartum care may begin when:

- There have been no seizures for 48 hours
- Urinary output is good
- Diastolic BP is below 110 mm Hg, although BP should be checked every 4 hours for several days

All women must be monitored carefully in the postpartum period. If BP remains high, longer-term management will need to be considered. Some women will go on to develop chronic hypertension that will potentially affect the outcome of future another pregnancies.

Summary

Gestational hypertension with proteinuria is an obstetrical emergency that requires prompt recognition, stabilization of the woman and fetus, and a multi-disciplinary approach to management and treatment. The primary obstetrical health care provider in rural and remote areas may have to assume the role of one or several specialists until help arrives or transfer is available. The cure of severe gestational hypertension is delivery, but the decision to deliver is based on maternal status and fetal maturity and well-being. The rationale for antihypertensive treatment is to prevent maternal cardiovascular accident not seizures. Seizure prophylaxis, when appropriate, should be magnesium sulfate. There is no agent that has been shown to be useful in the prevention of gestational hypertension.



Key Messages

1. Health care providers must be able to promptly recognize the various presentations of hypertension in pregnancy
2. Health care providers must be able to identify appropriate monitoring and management of gestational hypertension, including having a plan for referral and transfer to a higher-level health care facility when needed.
3. Health care providers must be able to take emergency measures to stop seizure activity, and to stabilize the woman.
4. Magnesium sulfate is a cost effective and life-saving drug. Health care providers must advocate with national health authorities to ensure a continuous and an uninterrupted supply of this medication as part of their safe motherhood programs.

Suggestion for Applying the Sexual and Reproductive Rights Approach to this Chapter

When a life-threatening emergency such as eclampsia occurs, health care providers need to be focused on the provision of care. In such emergencies, it is always useful to have someone available (who is not involved in the primary care of the woman) to talk to the woman's family. Keep family members informed about the status of the woman and what is happening to prevent them from feeling isolated. Also, if family members are not in the same room as the woman, let the woman know that her family is being told what is going on. This will relieve her anxiety, and increase her cooperation with the management plan.

An essential part of providing antenatal care is education about the signs and symptoms of problems that can arise during pregnancy and birth, and the importance of getting quick treatment.

Resources:

- World Health Organization. *Detecting Pre-eclampsia: A Practical Guide*. Geneva: World Health Organization; 1992.
- World Health Organisation. Managing eclampsia Education material for teachers of midwifery, Midwifery education modules - second edition. World Health Organization, 2006. Available from http://whqlibdoc.who.int/publications/2006/9241546662_2_eng.pdf
- World Health Organisation. *Pregnancy, Childbirth, Postpartum and Newborn Care: A guide for essential practice*. World Health Organization, 2003. Available from <http://hetv.org/resources/reproductive-health/pcpnc.pdf>

APPENDIX 1



Management Protocol for Gestational Hypertension

