FOGSI-GESTOSIS-ICOG

Hypertensive Disorders in Pregnancy (HDP)

Good Clinical Practice Recommendations

3rd Edition 2026

FOGSI Gestosis ICOG Guideline on HDP

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SECTION 1

Introduction

Hypertensive disorders of pregnancy (HDP) encompass a spectrum of conditions ranging from pre-existing chronic hypertension identified during the index pregnancy to complex multisystem disorders such as preeclampsia. These conditions can progress to severe complications, including eclampsia, HELLP syndrome, acute renal failure, pulmonary oedema, stroke, and left ventricular failure. Preeclampsia (PE), with severe features and its complications, is a major cause of maternal and perinatal morbidity and mortality. A recent global meta-analysis indicates that PE/Eclampsia and HELLP syndrome remain significant worldwide, with estimated prevalences of 0.43% and 0.39% respectively.[1]

Recent evidence indicates a rising prevalence of HDP in India. A systematic review of 22 studies involving 92,220 pregnancies demonstrates significant geographic variation in the burden of hypertensive disorders of pregnancy (HDP) across India. The estimated overall pooled prevalence of HDP was found to be 9% (95% confidence interval, 5%-17%).[2]

The zone-wise prevalence of HDP in India based on recent data is indicated below[2] (Table 1):

Table 1: Zone-wise Prevalence of HDP in India

Region (Zone)	HDP Prevalence (%)	95% Confidence Interval (CI)
Northern Zone	9.5	8.7 – 10.3
Southern Zone	9.2	8.9 – 9.5
Western Zone	8.9	7.5 – 10.3
Central Zone	7.7	7.1 – 8.2

In many parts of India, due to myths and misconceptions about pregnancy, poor transport facilities, low socioeconomic status, and limited access to multidisciplinary antenatal care contribute to major gaps in recognizing and managing HDP. These challenges are further compounded by the lack of accurate prediction methods and the scarcity of High-Dependency Units (HDUs).

SECTION 2

Need for Good Clinical Practice Recommendations (GCPR)

- To establish uniform, accurate definitions for all hypertensive disorders in pregnancy to ensure correct diagnosis and clinical application.
- To identify pre-conception and pregnancy-related risk factors for preeclampsia and other HDP, and develop effective prediction and prevention strategies.
- To specify essential investigations for accurate diagnosis, disease classification, and ongoing monitoring.
- To recommend timely, evidence-based interventions to minimize complications and improve maternal and perinatal outcomes.
- To enable early recognition and effective management of HDP to prevent progression to eclampsia and other life-threatening complications.
- To standardize treatment pathways and management protocols across institutions to reduce variation and enhance quality of care.
- To ensure early detection and appropriate management of de novo postpartum hypertension to optimize maternal outcomes.
- To recommend and standardise long-term cardiovascular follow-up for women with prior HDP, given the increased lifetime cardiovascular risk associated with preeclampsia.

SECTION 3

Classification of Hypertensive Disorders in Pregnancy[3]

3.1 Gestational Hypertension

Gestational hypertension is defined as a blood pressure ≥140/90 mmHg detected on two occasions at least 4 hours apart, occurring after 20 weeks of gestation, usually returning to normal within 6 weeks postpartum, in the absence of other features of preeclampsia.

3.2 Preeclampsia

Preeclampsia is a hypertensive disorder characterized by a blood pressure ≥140/90 mmHg detected on two occasions at least 4 hours apart, occurring after 20 weeks of gestation, in the presence of one or more of the following features:

- Significant proteinuria
- End organ dysfunction, including neurological complications, pulmonary edema, thrombocytopenia, hepatic and renal derangement, and uteroplacental dysfunction.

3.3 Eclampsia

It is the occurrence of generalized tonic clonic seizures in association with preeclampsia.

3.4 Chronic Hypertension

Chronic hypertension is defined as hypertension detected prior to pregnancy or before 20 weeks of gestation that persists beyond 6 weeks postpartum. It may represent either essential/primary hypertension or secondary hypertension.

3.5 Superimposed Preeclampsia

It is the occurrence of preeclampsia in women with chronic hypertension.

3.6 White Coat Hypertension[3]

White coat hypertension in pregnancy is defined as a blood pressure ≥140/90 mmHg in a clinical setting but <135/85 mmHg at home or on ambulatory blood pressure monitoring.

3.7 Masked Hypertension[3]

Masked hypertension in pregnancy is defined as a blood pressure <140/90 mmHg in a clinical setting, but ≥135/85 mmHg at home or on ambulatory blood pressure monitoring.

3.8 Classification of Preeclampsia Based on Severity[5]

3.8.1 Preeclampsia without severe features:

- Blood pressure ≥140/90 mmHg and ≤160/110 mmHg
- Absence of premonitory symptoms and normal laboratory parameters

Note: **Postpartum hypertension** is defined as a blood pressure ≥140/90 mmHg after delivery, which may be either de novo or a continuation of a pre-existing hypertensive disorder. This condition requires close monitoring and vigilant management to prevent adverse maternal outcomes.[4]

3.8.2 Preeclampsia with severe features:

- Blood pressure ≥160/110 mmHg with or without premonitory symptoms*, with or without abnormal laboratory parameters#, or
- Blood pressure ≥140/90 mmHg with premonitory symptoms* and/or abnormal# laboratory parameters.

{*Premonitory symptoms: headache, blurred vision, vomiting, right upper quadrant pain, sudden excessive weight gain, and severe edema}

{#Abnormal laboratory parameters: thrombocytopenia, elevated liver enzymes, elevated serum creatinine, and abnormal coagulation profile}

3.9 Classification of Preeclampsia Based on Onset of Disease

3.9.1 Early-onset preeclampsia:

- Onset of preeclampsia before 34 completed weeks.
- Maternal complications tend to be more severe, and fetal complications such as low birth weight, fetal growth restriction, and iatrogenic prematurity are common.
- It may warrant early delivery.

3.9.2 Late-onset preeclampsia:

- Onset of preeclampsia after 34 weeks.
- It is often associated with maternal metabolic factors as well.
- Maternal and fetal complications are generally less severe, compared to early-onset preeclampsia, with a lower incidence of low birth weight and fetal growth restriction.

SECTION 4

Screening for Preeclampsia:

- Universal screening for preeclampsia is recommended.[5]
- The HDP Gestosis Score (devised in India) involves the assessment of existing and emerging risk factors in the pregnant woman using an objective checklist at the first and subsequent visits.[5] This score can be accessed by clicking on https://www.hdpgestosisscore.com
- It is a dynamic scoring system which can be done even by basic level healthcare worker in any setting.
- It should be done at the first visit and preferably should be repeated at every antenatal visit until 32 weeks of gestation, or at least once in each trimester or on emergence of any new risk factors.
- It is accepted by the National Health Mission, India, and is practised routinely in many states.

4.1 HDP Gestosis Score (Table 2):

Score of 1, 2 or 3 are assigned to each clinical risk factor according to its severity in contributing to the development of preeclampsia.

- A thorough history and clinical assessment of the woman are used to calculate a cumulative risk score at regular intervals.
- A total score of ≥3 indicates that the pregnant woman is "At Risk" for Preeclampsia.

Table 2: HDP-GESTOSIS Score

Risk Factor	Score
Age older than 35 years	1
Age younger than 19 years	1
Maternal Anemia	1
Obesity (BMI >30)	1
Primigravida	1
Short duration of sperm exposure (cohabitation)	1
Woman born as small for gestational age	1
Family history of cardiovascular disease	1
Polycystic ovary syndrome	1
Inter pregnancy interval more than 5 years	1
Conceived with Assisted Reproductive (IVF/ ICSI) Treatment	1
MAP>85 mm of Hg	1
Chronic vascular disease (Dyslipidemia)	1
Excessive weight gain during pregnancy	1
Maternal hypothyroidism	2
Family history of preeclampsia	2
Gestational diabetes mellitus	2
Obesity (BMI > 35 kg/m^2)	2
Multifetal pregnancy	2
Hypertensive disease during previous pregnancy	2
Pregestational diabetes mellitus	3
Chronic hypertension	3
Mental disorders	3
Inherited / Acquired Thrombophillia	3
Maternal chronic kidney disease	3
Autoimmune disease (SLE[#]/ APLAS[^] / RA[@])	3
Pregnancy with Assisted Reproductive (Ovum Donation or Surrogacy) Treatment	3

Systemic Lupus Erythematosus; ^ Anti-phospholipid Antibody Syndrome; @ Rheumatoid Arthritis.

4.2 Multimodal Screening

- The multivariate assessment, performed between 11-14 weeks, provides a risk score based on Maternal Characteristics, Mean Arterial Pressure (Annexure 1), Uterine Artery Doppler Mean Pulsatility Index (PI) measurements (Annexure 3), and Serum Placental Growth Factor[6] https://fetalmedicine.org/research/assess/preeclampsia

Depending on available resources, any of these methods may be used for preeclampsia screening. However, it is essential that preeclampsia screening be integrated into routine clinical practice.

SECTION 5

Prevention of PE

5.1 Aspirin Prophylaxis

5.1.1 Dose:

- There is no clear consensus on a single best dose of aspirin.
- For screen-positive women based on the HDP Gestosis score, it is recommended to start 75mg aspirin/day[5] as early as possible.
- While those found positive on multi–modal screening may be offered 150 mg of aspirin/day.[3,6,7]

5.1.2 Timing of Initiation

- It should be started as soon as possible, and optimally before 16 weeks.
- However, it can be started even up to 20 weeks with some benefits.[8,9]

5.1.3 Factors affecting Efficacy:

- Compliance is important for risk reduction[9] (>90%).
- Aspirin should be taken at bedtime.[10]

5.1.4 Duration of Intake

- Aspirin should be continued at least till 36 completed weeks of pregnancy.[3]

5.2. Calcium Supplementation[11]

- A daily supplementation with 1.5 - 2 g of elemental calcium is recommended.
- There is emerging evidence on the effectiveness of even lower doses of calcium supplementation[12]

5.3. Vitamin D Supplementation[13,14,15,16]

- Current evidence for vitamin D supplementation for preventing preeclampsia is weak.
- Pending higher-quality data, a pragmatic regimen of 1,000-2,000 IU oral vitamin D per day is recommended.

SECTION 6

Maternal Alerts

Early identification of maternal danger signs and warning symptoms is critical to prevent severe complications of HDP such as:

- Eclampsia, HELLP syndrome and other system involvement
- Placental abruption, preterm birth
- Intrauterine fetal death

Why Maternal alerts are important in HDP[17]

- Preeclampsia can worsen rapidly and unpredictably.
- Many symptoms appear before seizures or organ failure.
- Early action can prevent eclampsia, HELLP syndrome, and maternal death.
- Helps in timely referral to multidisciplinary centers
- Helps in reduction of maternal and perinatal morbidity and mortality

Symptoms

- General feeling of malaise
- Nausea and Vomiting
- Pain in the epigastric region or upper right side of the abdomen
- Severe persistent headache
- Significant swelling in the hands, face, or eyes.
- Sudden weight gain: Gaining 1-2 kg in a week, or more.
- Vision changes: Blurred vision, seeing flashing lights or spots, or photophobia.
- Shortness of breath or orthopnea.
- Easy bruising, bleeding gums

Signs to monitor

- High Blood Pressure: >/= 140/90 mm of Hg
- Brisk tendon reflexes
- Altered consciousness
- Sudden onset of massive edema
- Significant Protein in Urine
- Reduced Urine Output
- Reduced Fetal Movements
- Vaginal bleeding and Uterine tenderness

Biochemical and Biophysical Alerts:

• sPO2	< 95 %
• LDH	>/= 600 u/l or a rising trend
• Sr. Creatinine	>/= 1 mg/dl
• AST / ALT	>/= 2 times the upper limit of normal
• Platelets	< 1, 50,000/mm3
• Sr. Uric Acid	> 5 mg/dl

Maternal alerts and warning signs in hypertensive disorders of pregnancy are early indicators of potentially life-threatening complications. Prompt recognition and management, timely referral (if required) and counselling, are essential for preventing maternal and fetal morbidity and mortality.[18]

SECTION 7

Diagnosis, Signs and Symptoms

7.1. Blood Pressure (BP) (Refer: Annexure-1)

- Blood pressure measurement is the most important clinical test to diagnose HDP.
- BP assessment is to be done with utmost care and proper technique.[19] Any arm left/right can be used to tie the cuff of the appropriate size snuggly.

7.2. Proteinuria:

Proteinuria should be defined as[20,21]

- ≥ 30 mg/mmol Urinary Protein:Creatinine Ratio (UPCR) in a random spot urine sample, or
- Albumin: creatinine ratio (ACR) ≥ 8 mg/mmol, or
- ≥ 0.3 g/d in a complete 24-hour urine collection, or
- ≥ 1+ by urinary dipstick.

Urinary dipstick method is quick and allows women with negative result to return home quickly. It also helps quick assessment of severe proteinuria. The results of spot protein: creatinine ratio also would be available within 2-4 hours. It is convenient for women at risk for pre-eclampsia and their health professionals. A 24-hour urine collection offers no advantage.

If proteinuria is absent, pregnant woman with hypertension requires frequent monitoring for proteinuria. Once proteinuria is established, further testing is not required, as it does not have prognostic value.

7.3. Laboratory Investigations (Refer: Annexure-2)

When blood pressure reading of a pregnant woman is =/> 140/90 mmHg (or known case of chronic hypertension visits first time to the antenatal clinic), following investigations are advisable to assess severity of the disease.

Baseline investigations[3]

- Urine albumin- by dipstick method or urine protein: creatinine ratio
- Complete blood count: Platelet count and anemia assessment
- Liver enzymes- Alanine aminotransferase (ALT), Aspartate transaminase (AST)-
- Lactate Dehydrogenase (LDH)
- Serum creatinine

Additional laboratory investigations

- Coagulation profile (when platelet count is < 150000 /mm3)
- Serum electrolytes (in severe disease)

7.4. Ultrasonography

Fetal surveillance and placental morphology (Obstetric USG with Doppler):

- Fetal biometry, amniotic fluid volume (AFI), and fetal doppler should be performed
- Placental location, morphology and any evidence of placental bed hemorrhage, abnormal adherence and presence of sinusoids should be documented.

Maternal abdominal ultrasonography is done to assess severity.

Following maternal organs are also to be assessed:-

- Liver: sub-capsular hematoma, hepatomegaly.
- Kidney: signs of renal causes of hypertension, other changes in renal parenchyma.

- Ascites and pleural effusion: as other worsening signs of preeclampsia.

7.5. Fundoscopy

Fundoscopy is required to differentiate between chronic and new onset disease and to diagnose papilledema/ hemorrhages as these have ominous prognosis.

7.6. Additional imaging:

- 2D maternal Echocardiography
  Preferably done in all cases of preeclampsia, once the condition is diagnosed. Maternal echocardiography detects left ventricular dysfunction. It is especially important in situations, where the mother is at a higher risk of developing cardiovascular complications.
- MRI for brain imaging
- Neuro imaging is not recommended universally in all cases of eclampsia. It is necessary for diagnostic dilemma of eclampsia, cerebral venous thrombosis, PRES and cerebrovascular accident

7.7. Biomarkers [22,23]

Based on the availability and necessity, the following markers may be done.

- Angiogenic markers, PlGF or sFlt-1/PlGF ratio could be performed. It confirms the diagnosis of preeclampsia and based on the value; prognosis can be gauged.
- Normal PlGF (≥5th centile for gestational age or 100 pg/ml on spot test) or normal sFlt- 1/ PlGF ratio (< 38), suggests that there is no uteroplacental dysfunction.
- Spot PlGF of 12 pg/ml or sFlt-1/PlGF of >85 indicates high risk for development of complications.

7.8 Follow-up investigations

- Maternal investigations should be repeated, the frequency based on the severity of the disease and clinical judgement.
- Upon admission to delivery room, women with pre-eclampsia should have a platelet count irrespective of when this was last performed, and any other required investigations.

Chronic hypertension:

- All women with chronic hypertension should have baseline laboratory investigations performed at first diagnosis in pregnancy. This provides a reference should suspicion arise later in pregnancy of superimposed pre-eclampsia.
- The frequency of follow-up investigations should be guided by blood pressure and other individual risks of adverse outcome.

Gestational hypertension:

- All women with hypertension should undergo testing for pre-eclampsia as mentioned.
- Normal values confirm the diagnosis of gestational hypertension.
- Proteinuria testing should be performed at each subsequent antenatal visit.
- Patient maybe admitted in day care for further evaluation and prognostication.
- Follow up should occur at least once weekly.

7.9. Antenatal Fetal surveillance in HDP

HDP increases the risk of uteroplacental insufficiency, FGR, oligohydramnios, preterm birth and stillbirth. Hence fetal surveillance is essential to detect early fetal compromise and balance the competing risks of prematurity versus in utero hypoxia.

Fetal Surveillance:

i) **Baseline**: anatomy scan with Uterine artery Dopplers.
   Risk stratification needs to be done and if previous risk factors like chronic HTN, prior FGR or abnormal Uterine artery dopplers are present, serial growth scan needs to be done from 28 weeks onwards.

ii) **Chronic hypertension or patients with previous history of severe preeclampsia, placental abruption or IUFD :** Growth scan with Dopplers every 4 weeks, starting from 28 weeks.[24]

iii) **Gestational hypertension/hypertension without severe features:** Growth scan with Dopplers from the time of diagnosis; if normal, then 4 weekly. Frequency of subsequent scans will depend on the ultrasound findings and severity of Hypertension.[25]

iv) **Hypertension with severe features/ Preeclampsia:**

- Inpatient monitoring.
- Cardiotocography on diagnosis or admission and then if clinically indicated
- Cardiotocography (NST) and Biophysical Profile (BPP): CTG or computerized CTG can be used as a routine antenatal testing modality.
- If pregnancy continues, 2 weekly growth scans with weekly or alternate day dopplers. Frequency will depend on the doppler findings and on severity of the maternal condition.

*Amniotic fluid assessment: AFI or single deepest pocket (SDP) should be assessed at each growth scan and more frequently if oligohydramnios is present. This prompts closer surveillance.

Frequency of Fetal Surveillance

i) If no FGR and mild disease: growth scan every 3–4 weeks; CTG as required.
ii) If FGR or abnormal UA Doppler (increased PI): Growth scans every 2 weeks; Doppler repeat 1–2/week; NST or Modified Biophysical profile 2–3 /week depending on severity.[26]
iii) If there is FGR with Absent End Diastolic Flow or Reverse End Diastolic Flow in the umbilical artery or abnormal Ductus venosus dopplers before 32 weeks or abnormal MCA with CPR < 5th centile after 32 weeks, then patients need to be monitored more closely with possible inpatient management and daily CTG.[3, 27, 28]

SECTION 8

Medical Management

- All types of HDP like chronic hypertension, gestational hypertension, preeclampsia should be treated with anti-hypertensive drugs[3]
- ISSHP /WOG recommend that a systolic BP of =/> 140 and/or a diastolic BP of =/> 90mm Hg warrants anti-hypertensive therapy.
- Isolated systolic hypertension should also be treated to avoid complications.

8.1. Anti-hypertensives for non-severe hypertension[6,26,29]

Drugs	Dosages	Advantages	Disadvantages
Labetalol	The starting dose is 100-200mg bd/tid gradually increased to achieve optimal control of BP Second antihypertensive may be added once 1200mg/day dose is reached. (The maximum total dose is 2400 mg/day in divided doses.)	First line and effective medication; preferred when baseline pulse is >100/min.	Contraindicated in asthma, CCF, DM, bradycardia. Can cause neonatal bradycardia and hypoglycemia which necessitates monitoring.
Nifedipine	The starting dose is 10-20 mg of slow- release preparation bd/tid per day. The maximum dose is 120 mg/day	Preferred medication when baseline pulse is < 100/min.	Maternal tachycardia, palpitations, headaches, and facial flushing. Should never be administered sublingually. Contra-indicated in aortic stenosis.
Methyldopa	The starting dose is 250-500 mg per day orally tid/qid, if available. The maximum dose is 2250mg/day.	Most time tested and safe anti-hypertensive	It can cause depression and postural hypotension.

- Target blood pressure to aim for is 135/85 mmHg.[3]
- The choice of the anti-hypertensive should be based on individual characteristics of the patient, contra-indications to the drug and physician preference.[3,29]
- If BP is not controlled with monotherapy even at mid-range dose, second drug is added from other first line or second line drugs.[3]

8.2. Other anti-hypertensive agents:[3]

Drug	Limitations
Amlodipine, Nicardipine, Metoprolol, or Diltiazem	Limited trial data
Oral hydralazine	Maternal tachycardia

Drug	Limitations
Prazosin	Rare instances of still-birth when used in pre-eclampsia
Diuretics	Reduced maternal circulating volume

Points to remember

- Oral anti-hypertensives in labor can cause sub-optimal BP control because of reduced gastric absorption. Parenteral anti-hypertensives may be given.
- Angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) are contraindicated in HDP because of potential fetotoxicity. They should be stopped in the pre-conception period.

Severe hypertension[6,11]

- Severe hypertension is systolic BP of 160 mmHg or higher and diastolic BP of 110mmHg or higher and should be treated urgently in a monitored setting.
- Intravenous labetalol, oral nifedipine, intravenous hydralazine, or IV nicardipine are first line drugs for severe hypertension.
- It should be given within one hour of presentation to prevent and minimize complications

8.3. Anti-hypertensives in severe hypertension[30]

Drug	Dosage	Points to remember
Labetalol	Slow IV injections: 20 mg initially Then doubling every 20 to 30 minutes (up to 80mg) if BP not controlled Maximum total dose of 300 mg is not to be exceeded Alternate IV infusion regimen: After initial loading dose, an infusion can be started at 1–2 mg/min and is titrated until desired effect.	Contraindicated in CCF, DM, Asthma and bradycardia.
Nifedipine	10-30 mg orally (Not sublingually) If BP is not controlled, can be repeated within 30-45 minutes. Max total dose of 120 mg is not to be exceeded. Once controlled, slow-release preparations are to be started.	Contraindicated in CCF and AV or SA nodal abnormalities
Hydralazine	5 mg, IV or IM, then 5 to 10 mg every 20 to 40 minutes. Once BP controlled repeat every 3 hours. For infusion 0.5 to 10.0 mg/h. If BP not controlled with 20 mg IV or 30 mg IM, consider another drug.	It has been associated with more maternal and perinatal adverse effects than intravenous labetalol or oral nifedipine such as maternal hypotension, caesarean sections, placental abruptions and oliguria.
Nicardipine[31,32]	The average starting dose is 1.5 mg/h. It can be increased up to 6 mg/h for desired effect according to 0.5 µg/kg/min	It is 100 times more water soluble than nifedipine, so it can be administered IV making it an easily titratable IV calcium channel blocker.

- The target BP to aim for is </= 140 / 90 mm Hg.
- The BP should be lowered promptly but slowly.
- Seizure prevention:[3,26] Loading dose of MgSO4 is recommended to prevent eclampsia in all cases of severe preeclampsia followed by maintenance dose for 24 hours.
- It will also have a neuro-protective effect for pregnancies between 26-32 weeks.
- Oral nifedipine and magnesium sulfate can be given concurrently.

8.4. Antihypertensive Drugs to be used in Refractory Hypertension

Nitroglycerin[33]	The starting dose is 5 µg/min and it is increased every 3–5 minutes by 5 µg/min, depending on BP response and symptoms.	**Can be used in a monitored setting when there are severe, refractory hypertension and pulmonary edema.**
Sodium[34] **nitroprusside**	**IV infusion of 0.5 to 4 mcg/kg/minute and then titrated to desired effect. Can rapidly reduce hypertension.**	**Used in refractory severe hypertension in a monitored setting. Causes peripheral vasodilatation of both arteries and veins by producing nitric oxide. Can cause cyanide toxicity and severe side effects if not monitored.**

Postpartum hypertension[3,26]

- During the hospital stay, blood pressure should be closely monitored for first 48 hours post-delivery.
- Anti-hypertensives used in the antenatal period should be continued.
- Antihypertensive therapy is recommended for persistent BP of SBP > 140 and DBP > 90 mm Hg.
- Persistent BP of ≥ 160 SBP and or DBP of ≥ 110 mm Hg should be treated within one hour and magnesium sulphate considered for seizure prophylaxis.

8.5. Fluid Management [3,26]

- Total fluid restriction (all inclusive) to 80ml/hour or 1ml/kg/hour is recommended. Pre-loading is not advisable in preeclampsia.
- Crystalloids like Ringer's lactate or normal saline should be used.
- Fluid restriction is advisable to reduce the risk of fluid overload in the intrapartum and postpartum periods.
- Inappropriate use of fluids can cause pulmonary edema and maternal death.

Point of care ultrasound[35]

- Point-of-care ultrasound (POCUS) can be used as a non-invasive and rapid method to assess fluid responsiveness which is very important in management of fluid therapy in HDP. It can be done for evaluation of the inferior vena cava (IVC), lung, and left ventricular outflow tract.
- It can predict fluid responsiveness and ultrasound of the lung can identify early development of pulmonary edema.
- PCPNDT rules for the usage of ultrasound in such indications must be followed according to the guidance of the appropriate authority.

Intrapartum Care for Pre-Eclampsia and Eclampsia

- Severe hypertension is a surrogate marker of adverse maternal and perinatal outcomes and should be treated aggressively to reduce severe maternal morbidity.[3]
- In patients with HDP, hourly BP recording in labour is recommended. If BP ≥160/110 mmHg, repeat BP every 15–30 minutes until reduced.[3]
- Continue antihypertensives in labour after the initial dose at appropriate intervals.[36]

8.6. Antenatal Corticosteroids

Corticosteroids are recommended in the following situations [3,26,36,37,38]

- Established preterm labor with contractions
- Preterm prelabour rupture of membranes (PPROM)
- Situations where decision for delivery is taken for maternal or fetal indications

Do NOT delay delivery solely to complete the course. Even a single dose before birth reduces RDS.[26,36]

Gestational Age Recommendations

- 24–34 weeks: When birth is expected within 7 days [39–43]
- Rescue course: Only one repeat course if birth is imminent and previous dose is given more than 7 days back (Recommended by WHO 2022, still controversial)
- 34–36^{+6} weeks (Late Preterm): Routine use is not recommended[39,42]
- 23–24 weeks (Periviable): Individualized decision with obstetric & neonatal teams[39,43]
- Must NOT be used routinely for Caesarean section at term [41,42]
- Must NOT be used to hasten resolution of HELLP syndrome [39]

Dosage

Dexamethasone:

- 6 mg IM every 12 hours × 4 doses (Govt. of India recommendation)[43]

Betamethasone Acetate-Phosphate (not available in India):

- 12 mg IM × 2 doses 24 hours apart[39-42]

Caution : In women with hyperglycaemia, admission & intensive glucose monitoring may be needed.[42]

8.7. Magnesium Sulphate ($MgSO_4$) for Fetal Neuroprotection

Indicated when very preterm birth is imminent; reduces risk of cerebral palsy (RR 0.68).[39–41]

Common consensus: Deliver prior to 32-34 weeks[44,45]

Optimal Timing: start $MgSO_4$ when

- Preterm birth is expected within 24 hours, OR
- Decision for iatrogenic early delivery has been taken [44-46]
- Ideally begin at least 4 hours before birth, but give even if delivery is sooner, some benefit persists[45]

Dosage

- 4 g IV loading dose over 20–30 minutes
- 1 g/hour IV infusion until birth
- Continue until delivery or up to 24 hours
- Stop after 24 hours if undelivered
- Repeat dose can be offered if next episode of preterm labour occurs after 4 weeks.[44]

SECTION 9

Delivery Decisions

9.1. Timing of delivery

Delivery is the only definitive management of preeclampsia and timing delivery can significantly help reduce maternal and neonatal morbidity and maternal mortality.

9.1.1. Gestational hypertension

- Based on the severity of hypertension and presence of complications, optimal timing can vary. In women with isolated gestational hypertension, who have had an occasional mild increase in BP, not on antihypertensives, delivery can be planned at 38 completed weeks.
- In women who have gestational hypertension with associated comorbidities, such as diabetes, obesity or those who have more frequent increase in BP, delivery is better planned by 37completed weeks.[47]

9.1.2. Chronic hypertension:

- In women with chronic hypertension who are on medication, delivery should be aimed at 37-38 completed weeks.

9.1.3. Preeclampsia:

- In preeclampsia without severe features, delivery is generally indicated at 37 completed weeks of gestation.[36,48]
- In pregnancies with complications, delivery is indicated between 34-37 weeks, depending on clinical features.
- In preeclampsia with severe disease with any worsening trend in maternal or fetal conditions delivery should be planned irrespective of gestational age after stabilization of the mother.
- Conditions requiring immediate delivery include:
  - Eclampsia and impending eclampsia
  - Severe hypertension despite three classes of antihypertensives
  - HELLP syndrome
  - Worsening thrombocytopenia, liver dysfunction
  - Abruption
  - Renal dysfunction
  - Pulmonary edema
  - DIC
  - Non reassuring fetal status
  - IUFD

9.2. Mode of delivery:

It depends upon the urgency to deliver, Bishop's score, gestational age, presentation and severity of FGR, if any.

The mode of delivery in women with preeclampsia (with or without severe features) should be guided by standard obstetric considerations.[36]

9.2.1. Induction of labor:

Informed consent should be taken before induction.

- Misoprostol(oral/vaginal), dinoprostone (vaginal gel/pessary) and mechanical methods are recommended for cervical ripening & induction of labor.
- In women with a dead or an anomalous fetus, oral or vaginal misoprostol are recommended for induction of labor. For this, recommended dose at term is 25 – 50 µg (PV) every 4 hours or 50 - 100 µg (Oral) every 2 hours.

- Buccal and sublingual misoprostol is not recommended for induction of labor with viable pregnancies.[49]
- In previous caesarean section or scarred uterus, prostaglandins & misoprostol are not recommended for induction. Mechanical method plus oxytocin as concurrent or sequential is recommended.[50]
- Augmentation of labor is to be done only with oxytocin after amniotomy

9.3. Choice of Analgesia and Anaesthesia

- Regional, epidural, or spinal anesthesia are preferred.
- Regional anesthesia should be considered in women with normal coagulation profile and adequate platelets (Higher than 70–80×10^9/L).
- In patients with an abnormal fetal heart rate, fetal asphyxia, placental abruption, pulmonary edema, HELLP syndrome, or severe thrombocytopenia, general anesthesia is recommended.
- Due to laryngeal edema, general anesthesia carries the risk of intubation failures and further complications

9.4. Intrapartum Monitoring

Close monitoring of the fetal heart rate with continuous or intermittent Doppler device or EFM (electronic fetal heart monitoring) is preferred. Laboratory investigations may be repeated when indicated.

9.5. Second Stage of Labor

Consider operative or assisted birth for women with uncontrolled hypertension.

9.6. Caesarean birth:

- The decision to perform cesarean birth should be individualized, based on anticipated probability of vaginal birth and on the nature and progression of preeclampsia disease state.

9.7. Active Management of Third stage of labour

Quality-assured uterotonic is recommended for the prevention of postpartum haemorrhage.
Only **one** of the following uterotonics should be used:

- Oxytocin (10 IU, intramuscularly/slow intravenously)/ is the preferred choice
- Heat stable Carbetocin (100 µg, intramuscularly/intravenously) is recommended in settings where cold chain cannot be guaranteed.
- Misoprostol (either 400 µg or 600 µg, oral or per rectal)

Uterotonics that are **not** recommended for AMTSL in preeclampsia are ergometrine/ methylergometrine, and injectable prostaglandins.[51]

SECTION 10

Eclampsia

10.1. All convulsions during pregnancy are to be treated as eclampsia unless proved otherwise.

Differential diagnosis

- **Incidental to the pregnant state** e.g. epilepsy, brain tumor, intracerebral haemorrhage (a/v malformations, ruptured aneurysms, sagittal sinus thrombosis or encephalitis or cerebral malaria)
- **Exacerbated by the pregnant state** (e.g., thrombotic thrombocytopenic purpura [TTP], hemolytic uremic syndrome [HUS], cerebral venous thrombosis), or diabetic hypo/hyperglycaemia or unique to the pregnant state (eg, eclampsia).

10.2. Prevention of eclampsia

Seizure prevention

Full dose of Mgso4 is recommended to prevent eclampsia in all cases of severe pre-eclampsia

10.3 Management of eclampsia

Principles of management of eclampsia

"Call for help": timely additional help is essential for effective management

A: **Airway:** lateral decubitus position, mouth gag and neck extension
Avoid injury to the mother

B: **Breathing**: nasal oxygen and suction
Pulse oximeter: maintain oxygen saturation >/ = 94%

C: **Circulation**: iv access for maternal resuscitation
Laboratory investigations to be sent as discussed earlier.
Crystalloids: ringer lactate or normal saline 80 ml/hr.
Control of convulsions: magnesium sulphate-loading and maintenance dose.
Catheterization: Foley's catheter is inserted and urine output measured hourly.
Control of blood pressure: with anti-hypertensives, as discussed.
Corticosteroids: for gestational age <34 weeks[52]

D: **Delivery:** baby should be delivered once mother is stabilized.

10.4 Magnesium sulphate

It is the safest drug recommended as first choice pharmacotherapy for eclampsia[53].

- ✓ Pritchard regimen is the preferred regimen.[54]
- ✓ Zuspan regimen can also be used
- ✓ Use 50% w/v ampoules preferably - as each ampoule contains 1 gram /2 ml.
- ✓ Mgso4 is to be continued 24 hours after delivery or last convulsions whichever is later.
- ✓ Clinical Monitoring is essential. Serum magnesium monitoring is not required routinely.

10.4.1. Pritchard Regimen

Loading dose

Total 14 grams = 4gm IV as 20 ml (20% solution) + 5 g (50% solution) deep intramuscular injection in each buttock.

If convulsion not controlled, after 15 min repeat 2 g of MgSO4 (4ml of 50% MgSO4 + 6ml of saline), Slow IV over 10 minutes.

***Intravenous :** 4 grams (4 ampoules of 50% w/v Mgso4 + 12 ml distilled water in 20 ml syringe) slow iv over 5-10 minutes.

4 gm/100ml of ready to use solution is also available which can be safely used.

Intramuscular: 5gram (5 ampoules of 50% w/v Mgso4 +0.5 ml 2% lignocaine) deep IM (in 10 cc syringe & with 20-g long needle) in each buttock.

Maintenance dose

5gram (as described above) deep IM in alternate buttock, 4 hourly.

Maintenance dose will be given **only if** following parameters are present.

1. Respiratory rate is > 16 / min
2. Patellar reflexes are present
3. Urine output >100 ml in last 4 hours.

10.4.2. Zuspan regimen

Loading dose:

Intravenous: 4gram (4 ampoules of 50% w/v mgso4 + 12 ml distilled water) slow IV over 5-10 minutes.

Maintenance dose: Intravenous infusion rate = 1 gm / hour preferably administered through infusion pump.

If using readymade 4 gm / 100 ml solution, only 6 such will be required for maintenance dose; which will be only 600 ml administration of iv fluids in 24 hours

Mother should be monitored hourly to check

1. Respiratory rate is > 16 / min
2. Patellar reflexes are present
3. Urine output >30ml/hr

If any one of the above are not fulfilled stop the infusion

10.4.3. Correlation of serum levels of Magnesium

Therapeutic levels:	4.0 - 7.0 meq//l
Loss of tendon reflexes:	> 7-10 meq/ /l
Respiratory depression:	> 10-12 meq/l
Cardiac arrest:	> 20-24 meq/l

10.4.4. Management of Toxicity with Magnesium Sulphate

Urine output <100 ml in last 4 hrs

- Check catheter patency
- If there are no other signs of Magnesium toxicity like Respiratory depression or absent patellar reflexes, then reduce the next IM dose to 2.5 g or the IV infusion to 0.5 g /hr
- Strict attention to be paid to blood loss and fluid balance.

Absent Patellar reflex

- If respiration is normal, further doses of Magnesium Sulphate to be withheld until reflexes return.
- Magnesium sulphate should be resumed in scheduled dose if necessary, once reflexes have returned.

Respiratory depression

- Stop Magnesium therapy.
- Administer Calcium Gluconate (intravenous) 10ml of 10% solution over 10 minutes with pulse oximetry and ECG monitoring, if available
- Put her in recumbent position
- Give Oxygen by mask @ 8-10 L / min.
- Maintain airway

Respiratory Arrest

- Stop Magnesium therapy.
- Intubate and ventilate immediately.
- 1 gm Calcium Gluconate, 10 ml 10% solution with ECG monitoring and /or Pulse oximetry.
- Ventilation to be continued till normal rate of respiration returns.

10.5. Management of recurrent convulsions

- Multi-disciplinary team must be involved in the management.
  Options : IV Thiopentone sodium 0.5gm dissolved in 20ml of 5% dextrose may be administerd by the anaesthesiologist.

- If fails – Intubate, muscle relaxants and assisted ventilation.
- Alternatively IV Levetiracetam* to be given which later on can be continued for 6 weeks in oral form.
- Continue MgSO4 maintenance dose
- Involve Neurologist

*Dosage of IV Levetiracetam : Initial loading dose 20-60mg/kg over 15 mins (max 3000-4500mg); maintenance dose 500-1500mg every 12 hrs.

Role of CT / MRI Brain in Eclampsia:

- Evaluate with neurological imaging if there are
  - Recurrent seizures
  - Focal neurological deficit
  - Very poor, unresponsive general condition
  - Blurring of vision
  - PRES

10.6. Complications of Eclampsia

Maternal Complications

- **Neurological:** CV Stroke, coma, permanent brain damage.
- **Organ Damage**: Liver failure, kidney failure, heart failure, pulmonary edema.
- **Blood Disorders**: HELLP syndrome, Disseminated Intravascular Coagulation (DIC)
- **Cardiovascular:** High blood pressure crises, myocardial infarction, peripartum cardiomyopathy.
- **Obstetric**: Obstetric haemorrhage.
- **Other:** Aspiration pneumonia, need for blood transfusions, maternal death.

Fetal & Neonatal Complications: Preterm birth, Low birth weight, Fetal growth restriction, Stillbirth or neonatal death.

Long-Term Risks: Increased risk for future cardiovascular disease and diabetes.

10.7. Delivery decisions in Eclampsia

- Should be delivered once mother is stabilized after MgSO4.
- Delivery decision should be carefully decided after assessing maternal and fetal risks.[55]
- Vaginal birth may be considered if maternal and fetal conditions permit and Bishop's Score is favorable.
- LSCS is done for obstetric indication.

*Transient fetal bradycardia can happen during convulsion; it may not be sign of fetal compromise

*Persistent fetal bradycardia can be a sign of placental abruption

10.8. Intrapartum management

It is appropriate to conduct delivery in a tertiary care centre with facility of obstetric expertise and accessible obstetric high dependency and critical care units with NICU, blood bank, anaesthesiologist, neonatologist.

10.9. Post delivery management

- It involves close vigilance for eclampsia, PPH, HELLP syndrome, pulmonary edema, cardiovascular, cerebrovascular events and thrombo-embolic complications.
- Continued postpartum surveillance has to be the norm to prevent additional morbidity as complications can develop post-delivery.
- During the hospital stay, blood pressure should be closely monitored every 4-6 hours for first 48 hours post delivery.
- Postpartum use of NSAIDs should be avoided.
- Antihypertensive therapy is recommended for persistent BP of SBP > 140 and DBP > 90 mm Hg.

10.10. Discharge planning

After stabilization discharge can be considered with instructions for home surveillance and regular follow up. Patients should be made aware of warning signs and symptoms (Annexure-4) and the importance of reporting to the hospital if they are encountered.

10.11. Post discharge management

Home BP monitoring by self or a visiting HCP

should be regularly practised and OPD review must be within 3-5 days or earlier if symptoms persist or recur.

10.12 Postpartum Care

Every patient of eclampsia should be monitored closely for 3 months with advice regarding antihypertensive medicines and regular visits. They should be guided and encouraged to use contraception at least for a period of 2-3 years. The preferred method would be an IUCD or progesterone only contraception (as per Medical Eligibility Criteria).

Women with early onset PE requiring delivery prior to 34 weeks of gestation should be tested for APLA (Primary Antiphospholipid Syndrome) at least 6-12 weeks after delivery.

They should be counselled regarding the importance of preconception counselling in subsequent pregnancies.

10.13 Referral Checklist

When patient is shifted to better equipped facility following measures should be taken.

- Magnesium sulphate- Loading dose of Pritchard regimen must be given and informed in writing to the referral centre.
- Antihypertensives in the form of Nifedipine 20 mg (slow release) or tablet Labetalol 200 mg orally along with the regular antihypertensive if already being taken by the patient (No sublingual nifedipine)
- First dose of corticosteroid for fetal lung maturity if gestational age less than 34 weeks.
- Transfer with an attendant and monitoring and information to the receiving center along with the eclampsia kit.

SECTION 11

Postpartum Hypertension

- Maternal BP typically drops immediately after delivery (blood loss and analgesia effects) to rise some days later (mobilization of the extra vascular fluid and pain)
- Post Partum HTN may be persistent HTN (within 48hrs) or de novo HTN starting 48hrs after delivery through six weeks postpartum [56,57]
- Post Partum complications secondary to HTN may be classified into immediate (hours-days), late (weeks-months) and long term[58] (years-lifelong).
- Other causes of secondary HTN like pre-existing renal disease, CVA, peripartum cardiomyopathy, pheochromocytoma, drug use need to be ruled out.
- Investigations are directed towards assessing the severity of the disease, to identify complications and rule out other diseases.

11.1. Managing Postpartum HTN

Close BP monitoring often over weeks (Figure 1) with starting or adjusting dose of medication appropriate to lactation

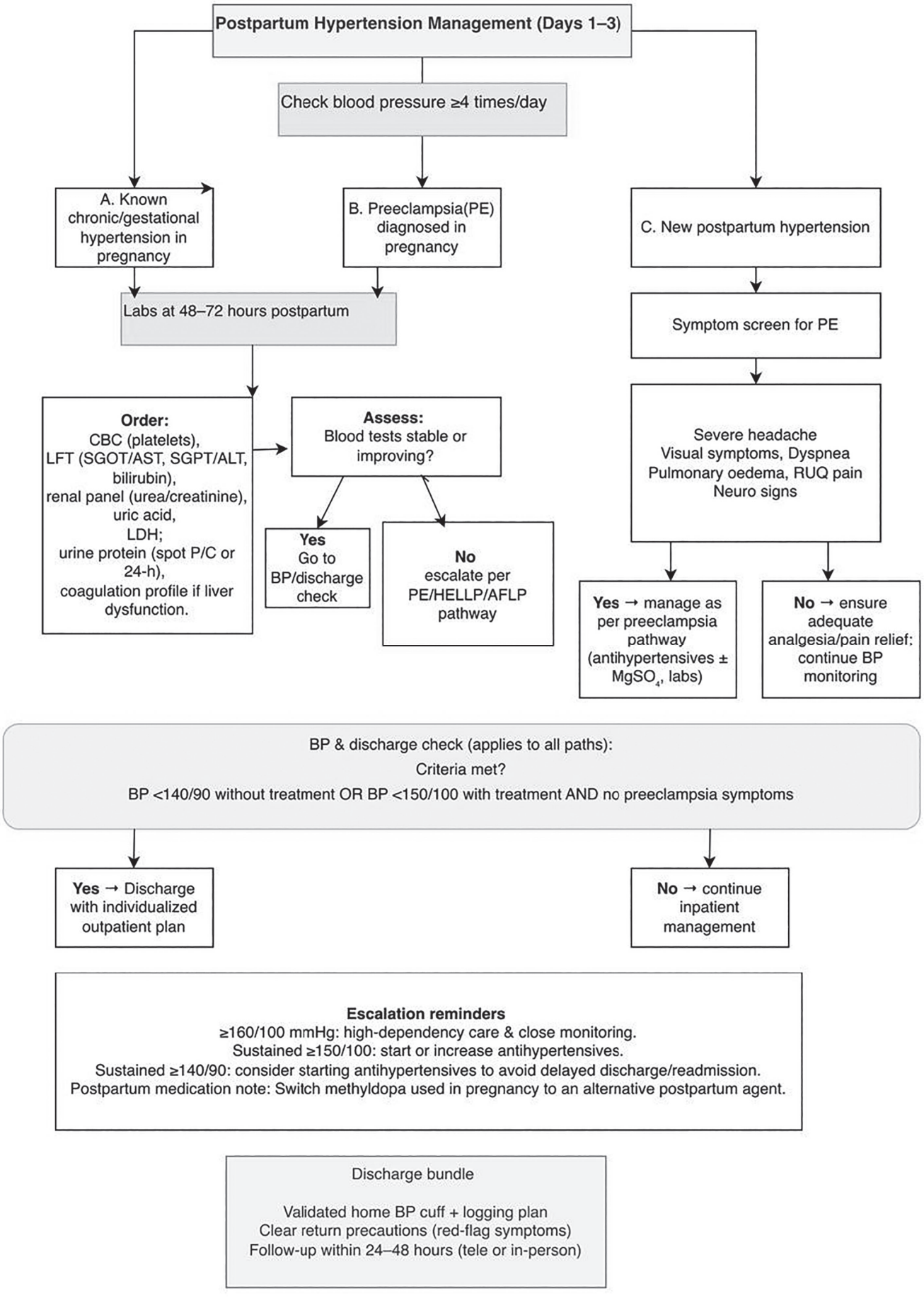
- Alpha and Beta Blockers (Labetalol 100-600mg 2-3 times daily; Atenolol 25-100mg once daily); Calcium Channel Blockers (Nifedipine SR 10-20mg twice daily; Amlodipine (5-10mg once daily); ACE Inhibitors (Enalapril 5-20mg twice daily)
- Methyldopa should not be used in the postpartum period.
- For women with significant volume overload, a short-course (3-5 days) of oral furosemide (20-80mg in divided doses) or hydrochlorothiazide may be considered
- Consider Thromboprophylaxis as appropriate: early ambulation, hydration and low molecular heparin for a few days to weeks depending on the risk factors
- Breast feeding for >12 months is linked to a lower risk of developing HTN later in a woman's life.[59]

11.2. Complications

- Immediate (within hours to days postpartum) eclampsia, stroke, pulmonary edema, renal and hepatic dysfunction, HELLP syndrome, maternal death
- Late (weeks to months postpartum) persistent hypertension, mental health issues, proteinuria and biochemical abnormalities, delayed resolution of organ dysfunction
- Long-term (years to lifelong) chronic hypertension, cardiovascular disease, renal disease, metabolic syndrome etc.

11.3. Follow up after discharge

- Mothers should be educated on red flag signs (e.g. headache, blurring, epigastric pain, shortness of breath etc.) needing urgent care to control BP and prevent complications
- BP should be measured twice daily for the first week at home, persistently elevated BP 12wks after giving birth
- The follow up plan is given in the checklist below


Postpartum Hypertension Management (Days 1–3)
Check blood pressure ≥4 times/day
A. Known chronic/gestational hypertension in pregnancy
B. Preeclampsia(PE) diagnosed in pregnancy
C. New postpartum hypertension
Labs at 48–72 hours postpartum
Symptom screen for PE
Order:
CBC (platelets),
LFT (SGOT/AST, SGPT/ALT, bilirubin),
renal panel (urea/creatinine), uric acid,
LDH;
urine protein (spot P/C or 24-h),
coagulation profile if liver dysfunction.
Assess:
Blood tests stable or improving?
Yes
Go to BP/discharge check
No
escalate per PE/HELLP/AFLP pathway
Severe headache
Visual symptoms, Dyspnea
Pulmonary oedema, RUQ pain
Neuro signs
Yes → manage as per preeclampsia pathway (antihypertensives ± MgSO4, labs)
No → ensure adequate analgesia/pain relief: continue BP monitoring
BP & discharge check (applies to all paths):
Criteria met?
BP <140/90 without treatment OR BP <150/100 with treatment AND no preeclampsia symptoms
Yes → Discharge with individualized outpatient plan
No → continue inpatient management
Escalation reminders
≥160/100 mmHg: high-dependency care & close monitoring.
Sustained ≥150/100: start or increase antihypertensives.
Sustained ≥140/90: consider starting antihypertensives to avoid delayed discharge/readmission.
Postpartum medication note: Switch methyldopa used in pregnancy to an alternative postpartum agent.
Discharge bundle
Validated home BP cuff + logging plan
Clear return precautions (red-flag symptoms)
Follow-up within 24–48 hours (tele or in-person)

✔	**Post-Delivery Follow-Up Checklist for Women with Preeclampsia / Eclampsia**
1	**General Health & Recovery**
	Check blood pressure at each visit (home readings if available)
	Assess for persistent symptoms: headache, visual disturbances, epigastric pain, swelling
	Review medication adherence (antihypertensives, anticonvulsants if prescribed)
	Monitor weight and general wellbeing
2	Card**iovascular & Renal Status**
	Urine dipstick/protein urea assessment
	Renal function tests (serum creatinine, urea, electrolytes if indicated)
	Assess for edema or signs of fluid overload
	Discuss long- term cardiovascular risk and need for lifestyle modification
3	**Neurological Status**
	Ask about seizures, confusion, or neurological deficits
	Screen for residual neurological symptoms (memory, concentration, mood changes)
4	**Postpartum Recovery**
	Lochia pattern and uterine involution
	Wound healing (cesarean section or episiotomy site)
	Breastfeeding status and support needs
	Contraception counseling (safe options in hypertensive women)
5	**Mental Health**
	Screen for postpartum depression or anxiety
	Ask about sleep, emotional wellbeing, and support systems
6	**Future Risk Counseling**
	Educate about recurrence risk in future pregnancies
	Advise on preconception counseling before next pregnancy
	Stress importance of early antenatal booking and regular monitoring
7	**Lifestyle & Preventive Care**
	Encourage balanced diet, salt restriction, and weight management
	Promote physical activity as tolerated
	Discuss avoidance of smoking/alcohol
	Long-term follow-up with physician for hypertension and metabolic risk
8	**Follow-Up Schedule**
	Early postpartum visit (within 7–10 days if severe disease)
	Routine 6-week postpartum check
	Annual blood pressure and cardiovascular risk assessment there after This checklist can be handed to patients
(Ref: 3,17, 25, 60,61)	

SECTION 12

Long Term Prognosis and Follow Up of HDP

Women who experience hypertensive disorders in pregnancy (HDP) including gestational hypertension, pre-eclampsia, and eclampsia, face significantly increased long-term risks for chronic hypertension, cardiovascular disease (CVD), stroke, renal disease and metabolic syndrome. This makes structured long-term follow-up an essential component of postpartum care.

- Hemodynamic alterations in women with a history of HDP can persist for years and predispose to long- term cardiovascular morbidity and mortality
- When compared with normotensive pregnancies within five years after delivery, a pregnancy with HDP doubles the risk of long-term CVD related morbidity and mortality.[62]

12.1. Risk Identification and Stratification with HDP

Risks of CVD, cerebrovascular morbidity, hypertension, type 2 diabetes and mortality are related to specific HDP parameters.

- Early-onset preeclampsia is associated with a higher burden of CVD-related morbidity and mortality compared with late-onset preeclampsia[63]
- Severe preeclampsia in more than one pregnancy is associated with a greater risk of premature CVD[64]
- Gestational hypertension presents with higher CVD risk factors and significantly higher blood pressure than women with preeclampsia
- Preeclampsia has a greater risk not only of later CVD but also of venous thromboembolism and neurological, renal and metabolic disorders
- Any HDP has a 2–3 fold increased risk of Type 2 diabetes later in life
- Preeclampsia is also associated with an increased risk of metabolic syndrome

12.2. Targeted interventions for improving cardiovascular risk with HDP

- Strategies with lifestyle and therapeutic interventions to reduce risk of future cardiovascular disease in those who have a history of HDP
- Longer breastfeeding duration to improve cardiometabolic risks and reduce risk of future CVD.
- At least 150 minutes of moderate-intensity exercise or more than 75 minutes of high intensity exercise per week to reduce the risk of future CVD.
- Combining the newborn vaccination schedule and short-term maternal cardiovascular follow-up enhance maternal adherence to the postpartum follow-up plan
- Counselling undertaken regarding the recurrence risk of HDP
- Stress on importance of preconception optimisation in future pregnancies that includes early antenatal booking and use of low-dose aspirin

12.3. Recurrence Risk of HDP

The recurrence rate of HDP is estimated at 20.7%.[62]

- Preeclampsia in 13.8%
- Gestational hypertension in 8.6%
- HELLP syndrome in 0.2%

Recurrence risk varies with the severity and time of onset of the initial episode

- Early-onset severe preeclampsia has greatest risk of recurrence (25 to 65%)[62]
- Preeclampsia without severe features has a much lower risk (5 to 7%)[62]

SECTION 13

Preconception Counseling in HDP

13.1. Importance of Preconception Counselling

Preconception counselling plays a pivotal role in reducing the risk and severity of hypertensive disorders in pregnancy (HDP).

13.2. Objectives of Preconception Counselling

- **Risk assessment** to evaluate maternal cardiovascular, renal and metabolic and autoimmune status before conception. Comorbidities such as diabetes, renal disease, obesity, autoimmune disease should be optimised
- **Medication optimization** to eliminate teratogenic or fetotoxic antihypertensives and initiate pregnancy-safe alternatives.
- **Health optimization** to control blood pressure and address weight, glucose, and lifestyle factors (smoking, alcohol & substance abuse).

13.3. Risk Stratification and Preconception Assessment

13.3.1 Medication Review and Optimization

Detailed medical, obstetric and medication reviews to optimise blood pressure before conception and replacement of teratogenic antihypertensives with pregnancy-safe alternatives.

Preferred antihypertensives before pregnancy include Beta blockers like Labetalol or Calcium channel blockers like Nifedipine and Amlodipine

13.3.2. Other medication considerations

- Statins are avoided in pregnancy and discontinued before conception[58]
- Diuretics may impair uteroplacental perfusion and are used cautiously[65]
- Low-dose aspirin is to be started as early as possible after patient is pregnant or by doing the HDP Gestosis score at the first antenatal visit.

13.3.3 Blood Pressure optimization

- BP < 135/85 mm Hg (in chronic HTN) should be achieved before conception
- Preconception stabilization on pregnancy compatible therapy[66]

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ANNEXURE 1

Precautions while Taking Blood Pressure (Technique and Device)

1. Patient must be seated, with feet supported, not cross legged, for5 minutes before B.P. is measured.
2. Bladder must be empty and patient must not have taken coffee, tobacco, at least 2 hours before measurement.
3. Left lateral recumbence is preferred than supine position in the bed-bound mother.
4. At least on first antenatal visit, Blood pressure must be taken on both arms.
5. Blood pressure should be taken as multiple readings and mean of 2 readings should be considered.
6. The right arm should be used thereafter if there is no significant difference between the arms.
7. First systolic blood pressure (SBP) should be taken at brachial artery by palpation method.
8. SBP is taken again with auscultatory method at Korotkoff phase I (KI).
9. Diastolic blood pressure (DBP) is recorded as Korotkoff phase V (K5) and if K5 is absent, it can be recorded as Korotkoff phase IV (K4).
10. A standard cuff should be used for arms with a circumference of ≤33 cm while the large cuff (15 × 33 cm) is used when circumference is >33 cm with the lower end of the cuff 2.5 cm above the antecubital fossa.
11. Validated, calibrated and properly standardized aneroid / digital equipment may be used. Mercury sphygmomanometers are being phased out and not available in many settings,

ANNEXURE 2

HDP Laboratory Parameters

A. Recommended Lab Panel & Surveillance—Stagewise[25]

Pregnancy stage	Minimum lab panel	When to repeat	Notes
Booking / first trimester (≤14 wk)	CBC (Hb, platelets), LFT (SGOT/AST, SGPT/ALT, bilirubin), renal (urea/creatinine, electrolytes), uric acid, baseline urine protein (spot protein/creatinine), fasting glucose/HbA1c (risk factors)	If HTN or risk factors—repeat at 20–24 wk	Establish baseline (important as creatinine falls in normal pregnancy); record lab ULNs used by hospital.
Second trimester (20–28 wk)	CBC & platelets, LFT (SGOT/SGPT, bilirubin), renal (urea/creatinine, electrolytes), uric acid, spot P/C	At diagnosis of GH/PE; then weekly (stable) or twice weekly if symptoms/severe BP	Screen for newonset proteinuria and organ dysfunction.
Third trimester (28–36 wk)	CBC & platelets, LFT (SGOT/SGPT, bilirubin), renal (urea/creatinine), uric acid, spot P/C	Weekly if stable; every 48–72 h if severe features/rapidly evolving	Intensify frequency when BP ≥160/110, symptoms, or falling platelets.
Term (≥37 wk) / intrapartum	CBC & platelets, LFT, renal, spot P/C	At admission; repeat every 24–48 h or sooner if deterioration	Guides timing of delivery and anaesthesia planning.
Early postpartum (48–72 h)	CBC & platelets, LFT, renal, uric acid, spot P/C; $MgSO_4$ monitoring if given	Once within 48–72 h; repeat if abnormal or symptoms	Postpartum preeclampsia can worsen; ensure followup & home BP plan.

B. Interpretation—Typical PIH/Preeclampsia Lab Abnormalities[26]

Parameter	Normal pregnancy trend	Preeclampsia diagnostic/concern thresholds	Severe feature thresholds
Platelets	Mild fall × late gestation; usually ≥150×10^9/L	<150×10^9/L = concerning	<100×10^9/L = severe feature (HELLP if with enzymes/LDH)
Creatinine	Falls (often ≤0.8 mg/dL)**	>1.1 mg/dL or doubling from baseline (no other renal disease)	Meets severe feature criteria; AKI risk
SGOT/AST, SGPT/ALT	Stable; may be slightly lownormal	≥2× ULN (use your lab's ULN; Indian labs often AST ~40 U/L, ALT ~56 U/L)	≥2× ULN with RUQ pain/clinical signs = severe feature

Parameter	Normal pregnancy trend	Preeclampsia diagnostic/ concern thresholds	Severe feature thresholds
Bilirubin	Unchanged/slight fall	Rising bilirubin supports hepatic involvement	Marked rise → consider HELLP/AFLP differential
Uric acid	Falls in 1st trimester, rises later but stays lower than nonpregnant	Rising uric acid supports disease activity (not a sole diagnostic criterion)	High/rapid rise → worse maternal & fetal risk; use adjunctively
LDH	Unchanged	≥600 U/L supports haemolysis (HELLP)	HELLP criteria: LDH ≥600, AST ≥70 U/L, platelets $<100\times10^9$/L
Urine protein	Negative/trace	Spot P/C ≥0.3 or 24 h ≥300 mg (dipstick ≥2+ only if no quantitative test)	Not required for dx when other severe features present; still prognostic

C. "Redflag" Differentials[67]

HELLP: Haemolysis (LDH ≥600 U/L), AST ≥70 U/L, platelets $<100\times10^9$/L ± bilirubin. Manage as severe preeclampsia; anticipate coagulopathy/hepatic complications.

AFLP (late 3rd trimester/postpartum): discuss if ≥6 Swansea criteria—elevated SGOT/SGPT >42 U/L, bilirubin >0.8–0.82 mg/dL, glucose <72 mg/dL**, **ammonia >47 µmol/L, creatinine >1.7 mg/dL, PT >14 s/ APTT >34 s, leucocytosis $>11\times10^9$/L, US bright liver/ascites.

ANNEXURE 3

HDP – Biophysical Parameters

Uterine Artery doppler

Uterine artery doppler analysis is well studied in the second trimester of pregnancy as a predictive marker for preeclampsia.

The second trimester uterine artery doppler studies at 18-20 weeks have shown 70-80% detection rate for late onset preeclampsia and 30-40% early onset preeclampsia in high risk patients. It has a high negative predictive value of 92-94%.

In recent years, first-trimester Doppler of the uterine artery performs better in the prediction of early-onset than late-onset preeclampsia.

As an isolated marker of future disease, its sensitivity in predicting preeclampsia and fetal growth restriction in low risk pregnant women is moderate, at 40–70%.

First trimester uterine artery PI combined with maternal characteristics could predict 45% of preterm preeclampsia at a false positive rate of 10%.

Mean Uterine artery PI 95th centile[68]

Weeks of Gestation	Transabdominal	Transvaginal
11-13 weeks	2.35	3.1
22-23 weeks	1.44	1.58
30-34 weeks	1.17	

Additional specialised parameters

- Soluble fms-like Tyrosine Kinase 1(sFlt-1)
- Placental growth factor (PlGF)

These above markers in combination increase the predictive value but are not cost effective at present.

There are many other markers used to improve predictivity but have not proven to be consistent while it is clear that maternal characteristics combined with biochemical and biophysical markers are more sensitive in predicting preeclampsia than maternal characteristics alone, there is currently insufficient evidence to support a recommendation on any particular approach.

ANNEXURE 4

Preparation of IV Labetalol

Labetalol can be administered as a slow IV injection (bolus) or as a continuous IV infusion. It is compatible with most standard IV fluids, including 0.9% sodium chloride and 5% dextrose[26].

Bolus Injection Preparation

- Form: Available as a solution, often 5 mg/mL.
- Preparation: The solution can typically be administered *undiluted*.
- Administration: Inject 20 mg (4 mL) slowly over a 2-minute period. Doses can be repeated every 10 minutes to a maximum total dose, or an infusion may be started.

Continuous Infusion Preparation (2 mg/mL concentration)

- **Step 1: Preparation:** Withdraw 40 mL of 0.9% sodium chloride from a 100 mL bag. Add 200 mg (40 mL) of labetalol injection to the remaining 60 mL in the bag.
- **Final Concentration:** 2 mg/mL.
- **Administration:** Start infusion at 10 mL/hour (20 mg/hour) and titrate to the desired blood pressure, typically every 15 to 30 minutes, to a maximum of 80 mL/hour (160 mg/hour).

Preparation of IV Hydralazine

Hydralazine is primarily used for hypertensive emergencies in pregnancy (eclampsia/pre-eclampsia) and is administered by slow IV injection or infusion. Avoid prolonged contact with metal components during preparation and administration.

IV Bolus Injection Preparation (1 mg/mL concentration)[26]

- Step 1: Reconstitution: Add 1 mL of Water for Injection to the 20 mg ampoule and shake gently to dissolve. The resulting concentration is 20 mg/mL.
- Step 2: Dilution: Further dilute 1 mL of the 20 mg/mL solution with 19 mL of 0.9% sodium chloride to achieve a final volume of 20 mL.
- Final Concentration: 1 mg/mL.
- Administration: Administer 5 to 10 mg by slow intravenous injection over 3 to 10 minutes. Doses can be repeated if necessary.

Preparation of Nicardipine

To prepare parenteral nicardipine from a single-dose vial (25 mg/10 mL), it must be diluted before administration. Nicardipine is also available in ready-to-use premixed bags which require no further dilution.

The typical concentration for continuous intravenous infusion is **0.1 mg/mL**.

1. **Select a Compatible Fluid:** Nicardipine hydrochloride injection is compatible with several infusion fluids, including Dextrose 5% in water or saline solutions, and Sodium Chloride 0.45% or 0.9% solutions. It is **not** compatible with Sodium Bicarbonate 5% or Lactated Ringer's Injection. Compatibility is maintained for 24 hours in PVC containers at room temperature with the listed fluids.
2. **Dilute the Vial:** A common method to achieve the 0.1 mg/mL concentration is to add the entire contents of a **25 mg/10 mL** vial to **240 mL** of a compatible IV fluid. This creates a total volume of 250 mL at the desired concentration.
3. **Inspect the Solution:** Before use, visually check the diluted solution for any particles or discoloration. Do not use if these are present.
4. **Protect from Light:** Keep the solution protected from light until administration.

Administration Guidelines

- Administer as a slow continuous intravenous infusion through a central line or a large peripheral vein.
- If using a peripheral vein, change the infusion site every 12 hours to lower the risk of local irritation.
- Avoid combining nicardipine with other products in the same IV line or container.
- Dosage needs to be determined for each patient and carefully monitored.
- A typical starting dose for patients not on other medications is 5 mg/hr, which can be increased by 2.5 mg/hr every 5-15 minutes up to a maximum of 15 mg/hr.