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Hypertensive Disorders in Pregnancy Guidelines- 2022

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ABSTRACT

The Society of Obstetricians & Gynecologist Pakistan Hypertensive Disorders of Pregnancy (SOGP-HDP) guideline is evidence based practical clinical guide to the management of pregnant women with hypertension. It defines hypertension, preeclampsia & severe hypertension, encourages measuring blood pressure (BP) accurately, preferably by automated/ mercury blood pressure monitors. The guideline gives an approach to screening, risk prediction and prevention of pre-eclampsia and management of hypertensive disorders of pregnancy. The guideline emphasizes experienced team management approach and mandatory hospital protocols for the management of pregnant women with hypertension. The aim is to have locally tailored easy to follow protocols for preconception care, screening, prevention and management of women at risk of preeclampsia; management of chronic hypertension in pregnancy, antihypertensive therapy for severe and non-severe hypertension. In addition, it discusses post-partum management, contraception, follow-up, discusses risk of recurrence and long-term follow up for women with preeclampsia to mitigate future cardio-metabolic risks to maternal health associated with hypertensive disorders of pregnancy.

Keywords: Guideline, Hypertension, Pregnancy, Pregnancy outcome, Preeclampsia, Prognosis.

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1. OVERVIEW AND GUIDELINE DEVELOPMENT METHODOLOGY

Hypertensive disorders in pregnancy (HDP) are a leading cause of maternal and perinatal morbidity and mortality globally.[1] Despite awareness about HDP women continue to develop complications/die as a result of hypertension more so in low and middle income countries (LMIC).[2] Evidence is building to suggest that lifestyle interventions are useful in reducing the risk of cardiovascular disease in women whose pregnancy was complicated by hypertension.[3] Consensus on diagnostic criteria, classification of HDP, when to treat hypertension in pregnancy and timing of delivery has been difficult to achieve. The uncertainty has led to differences in rates of adverse maternal and fetal outcomes for the various HDP, particularly preeclampsia between different health care facilities.[4] This prompted SOGP to develop national, updated, evidence based, user friendly consensus document.

This guideline is pragmatic, evidence and consensus based, locally adapted, practical guidance to all health care professionals (HCPs) including obstetricians, general physicians, primary health care providers and nurse practitioners. It has been developed with the input from a team of obstetricians from various regions of the country. The writing group members were drawn from a variety of clinical settings-public, private and Armed forces, from high-and low-income urban settings, regional and rural/remote settings, having expertise in hypertension in pregnancy. There was no funding available and work was completed on a purely voluntary basis.

The International literature including educational resources (Medline, Cochrane Database of Systematic Reviews (CDSR) and UpToDate) and multiple guidelines for managing HDP were reviewed. Each member of the guideline group was assigned a section of the guideline to write; with few writing multiple sections. Sections were then reviewed by all members in multiple weekly zoom meetings, and a consensus was achieved. Final editing was done by a group of 4 members. The document was peer reviewed by international and national reviewers and was pilot tested.

Keeping in view rapidly developing medical evidence, the guidelines are proposed to be a living

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document, to be reviewed and updated 2 years from publication.

2. EXECUTIVE SUMMARY

Hypertensive disorders of pregnancy (HDP) are one of the commonest medical disorders encountered by pregnant women worldwide with a global prevalence of 10% in the obstetric population with LMIC affected the most.[3,5] The prevalence of maternal chronic hypertension has increased many fold, largely secondary to the obesity, gestational diabetes (GDM) epidemic and increasing maternal age. The trend is expected to continue.[6-8] Preeclampsia (PE) is the predominant gestational hypertensive disorder, with a significant impact on maternal and neonatal health including severe morbidity, long term disability and death particularly if early in onset (PE <32 weeks gestation).[3,5,6] The majority of complications due to preeclampsia and eclampsia are avoidable through timely and effective care.[3,5] The document clarifies the criteria used to define and diagnose different types of HDP and recommends practical evidence based best practice recommendations based on available literature, new research data and expert opinion. Optimizing health care to prevent and treat women with HDP will help achieve Sustainable Development Goals.

The major challenge in management of HDP is to balance achieving fetal maturation in utero with the maternal & fetal risks of continuing the pregnancy. The risks include progression to eclampsia, development of placental abruption and HELLP (hemolysis, elevated liver enzyme, low platelet) syndrome.[9] On the other hand, preterm delivery is associated with higher perinatal and infant mortality and morbidity resulting from small for gestational age (SGA), thrombocytopenia, broncho-pulmonary dysplasia, cerebral palsy, and significant long term morbidity (increased risk of diabetes mellitus, obesity, coronary artery disease, and hypertension in adult life).[9] Women with PE, in the long run face an increased risk of death from future cardiovascular disease, hypertension, stroke, renal impairment, metabolic syndrome, and diabetes. The life expectancy of women who develop preterm PE is reduced by 10 years on average.[10]

Despite the known association of HDP with adverse maternal and perinatal outcomes, to date there has been confusion, disagreement and lack of consensus amongst international health organizations on screening and diagnostic criteria for HDP, requirement of proteinuria for diagnosis of preeclampsia, BP at which treatment is to be started and timing of delivery.[11] Given the known relationship between HDP and poor pregnancy outcomes, there needs to be a greater focus on prevention, early identification (screening, diagnosis), PE risk prediction and management of HDP.[5,11] Considering the role of in-utero genetic imprinting in increasing the risk of cardiovascular disorders in the off springs of mothers with HDP, as well as increasing maternal vulnerability to future diabetes and cardio-metabolic disorders; Pregnancy offers a unique opportunity not to be missed, for primary prevention of adverse consequences of hypertension and reduce the future burden of Hypertension.[12,13]

HDP practice survey amongst HCPs recently carried out in public sector hospitals revealed wide variation in diagnosis, admission, management and timing of delivery practices for HDP. This stimulated the idea for the national guideline with the objective to equip all HCPs with strategies for earlier identification and timely management of women with HDP, improve clinical practice and prevent hypertension and its long term sequelae later in life by continued postpartum follow up, BP monitoring timely referral and treatment.

Preconception care is recommended for all women with pre-existing hypertension to optimize BP control, general health and weight; assess for complications; review of medications; folic acid supplementation and patient education.[14]

The guideline recommends early universal screening for HDP in all pregnant women at booking using automated/mercury BP monitors.[3] All women diagnosed to be hypertensive are offered screening for preeclampsia in first trimester by maternal characteristics, mean arterial BP measurement (MAP) and Uterine artery Pulsality Index (UTPI). Risk is calculated by web -based FMF calculator available free of cost.[11] Women in low resource settings can be screened for preeclampsia by two parameters namely maternal history and MAP. Women with risk score of >1 in 100 are recommended to take 150 mg Aspirin and 1 gm Calcium to prevent PE.[11]

Antenatal management commences with counseling and education of pregnant women with HDP along with their families. The focus is on optimizing BP control. Home BP monitoring/BP checks at nearby health care and 2 weekly antenatal visits are encouraged. First line antihypertensive recommended is Labetalol, followed by Nifedipine and Methyl-Dopa.[15] Target BP recommended is 130/85 mmHg.[3,5,6] Magnesium Sulphate is recommended for seizure prophylaxis

and treatment.[3,5] In utero transfer to tertiary care health care facility is encouraged in case of severe hypertension or expected preterm delivery.[7,8] Apart from routine fetal surveillance growth scans and umbilical artery Doppler studies are recommended from 28 weeks of gestation. The guideline addresses each HDP separately in detail with a separate section devoted to severe hypertension.

Timing of delivery depends upon BP control, associated complications, and fetal condition. The optimal time of delivery for women with well controlled simple gestational and uncomplicated chronic hypertension is between 38-39 weeks of gestation.[7] Timing of delivery is earlier and individualized for women with PE and severe hypertension. No pregnancy complicated by HDP to go beyond 40 weeks of gestation.[8] Vaginal delivery is encouraged. Caesarean section is recommended for obstetric reasons only.[7,8]

Considering postpartum risk of severe hypertension and eclampsia, in addition to routine postpartum care, frequent monitoring of maternal BP and escalation of care to Obstetric critical care unit (if required) is offered.[16] All women with hypertension are recommended to be monitored as inpatient for at least 48 hours. Methyl-Dopa if used antenatally is stopped within 48 hours of delivery and changed to safer options.[7,8] At discharge patients are educated to identify red flag symptoms and signs and asked to report in gynecology emergency/triage. Guideline issues guidance for breast feeding, contraception and long term follow up. It emphasizes that future pregnancy in a woman with HDP needs to be planned. Women with HDP are counseled to report in Preconception clinic when planning pregnancy subsequently to optimize pregnancy outcomes. Effective long acting reversible contraception is recommended.

Postpartum the woman is advised to continue life style modification and regular follow up in order to reduce development of hypertension and cardio-metabolic complications, hence reducing the prevalence of non-communicable diseases (NCDs).

Guideline developing methodology along with the strengths and limitations of the evidence based consensus document are given. Future research recommendations are suggested to better understand HDP in the country and see the impact/change in clinical practice by the implementation of the national SOGP-HDP guidelines in the country.

SOGP HDP guideline recommendations are based upon available literature and expert opinion and will be reviewed after two years.

STRENGTHS

1. Written by experienced obstetricians belonging to all health care settings nationwide.
2. Peer reviewed by renowned international Obstetrician and physicians.
3. Endorsed by Pakistan Society of Internal Medicine (PSIM) and Hypertension League of Pakistan.
4. Guideline has been Pilot tested.
5. All aspects including management for each disorder along with separate section on severe hypertension, intrapartum care, postpartum care, contraception and long term care of women with HDP.
6. Implementing the guideline will enhance safe patient care, promote uniform practices and help achieve Sustainable Development Goals.

LIMITATIONS

1. The quality of evidence for the recommendations in the document has not been graded, although relevant references and explanations are provided for each recommendation.
2. Local references are few as local research is lacking and this is the first national guideline.
3. PlGF based testing has not been discussed in detail as it is not available in the country at present.
4. The guideline does not address routine pregnancy care. It primarily addresses the specific issues pertaining to hypertensive disorders in pregnancy.
5. The relationship between the social determinants of hypertension and management in pregnancy is beyond the scope of the guideline and has not been evaluated in the already lengthy clinical guideline.
6. The unique needs of women of different cultures and strata of society have not been catered for.

3. INTRODUCTION

An estimated 295,000 women died worldwide in 2017, as a result of pregnancy and childbirth or its complication with 99% of the deaths occurring in low and middle income countries (LMIC).[17] Hemorrhage, hypertensive disorders and sepsis were responsible for more than half of all maternal deaths. Globally complications arising from HDP are among the leading causes of preventable severe maternal and perinatal morbidity and mortality.[17] Timely and appropriate treatment has the potential to significantly reduce hyper-

tension-related complications.[10,18] There is an ongoing need to spread awareness, improve knowledge for timely identification of HDP and PE even within the medical fraternity because of variations in practice and standards of care. Our objective is to formulate up dated, evidence based, best practice, user friendly, easy to implement tailored to the local context guidelines for all health care providers including nurse practitioners. This is to ensure all pregnant women are screened for HDP, diagnosed timely and treated appropriately to improve health outcomes.[10,18] To improve quality of care, reduce complications and minimize risks healthcare managers, policy makers and HCPs are strongly encouraged to adopt and deploy the standard guidelines.[19,20] The Guidelines emphasizes measuring BP accurately by a validated calibrated BP apparatus (ideally automated) using the right Cuff size fulfilling all prerequisites. It is also recommended that hospitals provide education about preeclampsia to all expectant mothers.

The SOGP–HDP guidelines provides practical guidance on classification, diagnostic criteria, and management for all clinicians, everywhere, who are involved in the management of women with HDP. It helps to coordinate and standardize the care provided to women with HDP during pregnancy and the postpartum period nationwide in all health care settings. It outlines clinical evidence based practices that should be disseminated, adapted and implemented in every maternity care setting, there by reducing confusion around diagnosis and management of women with HDP and making practice uniform.

4. DEFINITION AND CLASSIFICATION OF HYPERTENSION IN PREGNANCY ([3,5,7])

- Hypertension in pregnancy is defined as systolic BP (SBP) ≥140 mmHg or diastolic BP (DBP) ≥90 mmHg on at least 2 occasions at least 4 hours apart, in a previously normotensive woman or SBP ≥160 mmHg or DBP ≥110 mmHg reconfirmed within 15 minutes.
- Recommended technique for BP measurement
  - BP should be measured by a calibrated automated /mercury spy manometer. SOGP- HDP group recognizes that in many areas of the country only aneroid devices are available and despite their inaccuracy aneroid devices will need to be used. Regardless of the method used, we recommend a minimum of two BP measurements to diagnose hypertension.
  - Use appropriate cuff size: medium/large/thigh cuff for morbidly obese. It should be 1.5 times upper arm circumference.
  - Avoid tobacco or caffeine intake 30 minutes preceding the measurement (lead to temporary rise in BP).
  - Outpatient setting: Sitting posture after a 10-minute rest period.
  - Inpatient setting: Measure either sitting up or lying in left lateral position with arm at the level of the heart
  - BP should be taken on both arms at the first antenatal visit. The right arm should be used thereafter if there is no significant difference between the arms.
  - When measuring BP, SBP should be palpated at the brachial artery before inflating the cuff to 20 mmHg above the recorded level. The cuff should then be deflated slowly. DBP is recorded as Korotk off phase V (K5) / IV (K4) if K5 is absent. When a woman with Hypertension is encountered by a HCP, the first step should be to classify it so as to tailor feto-maternal surveillance and management.

Recommended Classification for HDP

- Preeclampsia –eclampsia
- Gestational hypertension
- Chronic hypertension essential secondary white coat
- Preeclampsia superimposed on chronic hypertension

Gestational Hypertension:

New onset hypertension after 20 weeks of gestation in a previously normotensive woman without proteinuria or features of end organ damage (thrombocytopenia, renal insufficiency, elevated liver transaminases, pulmonary edema, cerebral or visual symptoms) followed by return of bp to normal within 3 months' post-partum.[5]

Preeclampsia:

New onset hypertension after 20 weeks gestation in association with new-onset one or more of the following conditions:

1. Proteinuria (spot urine protein/creatinine >30 mg/mmol [0.3 mg/mg] or >300 mg/24 hours o['2 + '] on dipstick testing)
2. Evidence of maternal end organ dysfunction:

- Thrombocytopenia (platelet count <100,000/dL).
- Renal insufficiency (serum creatinine of >1.1 mg/dL [97 micromol/L].
- Impaired liver function (raised liver transaminases at least twice the normal or severe persistent right upper quadrant or epigastric pain unresponsive to medication).
- Pulmonary edema.
- Persistent neurological (altered mental status/hyperreflexia/clonus, severe headaches) or visual symptoms.[5]

3. Uteroplacental dysfunction (fetal growth restriction).

Proteinuria is not essential for the diagnosis of PE.

4.4 Eclampsia:

In a patient with preeclampsia, generalized seizures that cannot be attributed to other causes (5)

4.5 HELLP syndrome (hemolysis, elevated liver enzymes, low platelets):

HELLP is considered a variant of preeclampsia).[5]

4.6 Chronic Hypertension:

Hypertension diagnosed before pregnancy or before 20 weeks of gestation or that is first diagnosed during pregnancy and persists at least 12 weeks post-delivery.[5]

4.7 Chronic hypertension with superimposed preeclampsia

Any of the following in a patient with chronic hypertension:

- A sudden increase in blood pressure that was previously well-controlled or an escalation of antihypertensive therapy to control blood pressure
- New onset of proteinuria or sudden increase in proteinuria in a patient with known proteinuria before or early in pregnancy.[5]

4.8 Chronic hypertension with superimposed preeclampsia with severe features

Any of these findings in a patient with chronic hypertension and superimposed preeclampsia:

- Systolic blood pressure ≥160 mmHg or diastolic blood pressure ≥110 mmHg despite escalation of antihypertensive therapy.
- Thrombocytopenia (platelet count <100,000/ microL).
- Impaired liver function as indicated by liver transaminase levels at least twice the normal concentration or severe persistent right upper quadrant or epigastric pain unresponsive to medication and not accounted for by alternative diagnoses, or both.
- New-onset or worsening renal insufficiency.
- Pulmonary edema
- Persistent cerebral or visual disturbances.[5]

5. SCREENING AND PREVENTION OF PREECLAMPSIA

5.1 First trimester screening for PE

Early identification of 'women at risk of PE' will allow for prevention, heightened/ individualized ante-natal maternal and fetal surveillance, early recognition of PE and prompt intervention. All pregnant women diagnosed to be hypertensive are offered screening for preeclampsia in first trimester.[11,21,22]

5.1-2: Universal Screening for early identification of pregnant women at risk of PE in first trimester (11–14 weeks) using maternal characteristics, Mean Arterial pressure (MAP) and Uterine artery pulsatility index (UtPI) for is recommended.[11,23] (local detailed PE screening and prevention guidelines are under publication).

5.1-3: Data is entered into the web based FMF2012 software tool available free of charge at https://fetalmedicine.org/research/assess/preeclampsia.Risk is calculated automatically.[24]

5.1-4: Individualized Risk assessment is done. The cut of risk is taken to be "1 in 100".[24]

5.1-5: In low resource settings screening to be done by at least two parameters - maternal factors and MAP. Maternal risk factors alone should not be used for first trimester PE screening as this would lower the performance of the screening. Adding PlGF where available will improve risk prediction.

5.2-Prevention

There is no cure for PE other than delivery; therefore interventions to prevent PE will have a significant impact on maternal and infant health worldwide.[11,21]

5.2-1: Offer tablet Aspirin 150 mg at bedtime initiating before 16 weeks and continue till 36 weeks.[22,23]

5.2-2: Tablet Calcium 1 gram daily from 16th week.[24]

5.3-3: Educate all at risk women about signs and symptoms of PE.

5.4-4: Close fetal and maternal surveillance enabling early detection and timely intervention.

Preventive strategies will work to prevent preterm PE. It will not prevent term PE.[24,25]

6. MID TRIMESTER RISK PREDICTION FOR PE

A 100 percent reliable test for mid trimester screening for PE is not available .Mid trimester Uterine artery Doppler ultrasonography at 22–24 weeks predicts risk of developing PE/IUGR with an accuracy of 60%.[26] Test like PIGF (placental growth factor) sFlt-1 (soluble Fms-like tyrosine kinase 1), and sEng (soluble Endoglin), are still under research.[27]

PIERS clinical predictive model, can predict the likelihood of severe adverse maternal outcome using the following variables 6–48 h after admission with PE: gestational age, chest pain or dyspnoea, oxygen saturation, platelet count, serum creatinine, AST.[27]

7. ASSESSMENT OF PROTEINURIA[(5)]

7.1: Accurate assessment of proteinuria is important for identifying risk to pregnancy and to make decision for admission and management.

7.2: Screening is done at each antenatal visit by dipstick testing using an automated/ visual reagent strip.

7.3: Quantification of proteinuria is done if dipstick screening is positive (1+ or more) by spot Urine Protein Creatinine Ratio (cut-off >30 mg/mmol) or spot Urine Albumin Creatinine Ratio (cut-off 8 mg/ mmol). First morning urine should not be tested. 24-hour urine collection are cumbersome and not recommended.[10]

8. MATERNAL INVESTIGATIONS IN HDP[(5)]

8.1: In women with non-severe hypertension, measure full blood count, liver function test, renal function tests at presentation then 1- 2 weekly.

8.2: In women with severe hypertension, measure full blood count, liver function test, renal function tests at presentation then twice weekly. Elevated serum uric acid > 5.2 mg/dl increases risk of PE.[5]

9. FETAL INVESTIGATIONS IN HDP

Risk of perinatal morbidity and mortality is higher in pregnancies complicated with HDP. Careful fetal surveillance can prevent complications or can reduce their severity.[28]

9.1: Accurate dating of pregnancy is important to detect growth restriction later in pregnancy.

9.2: Measurement of symphysio-fundal height is less sensitive and a poor predictor of fetal growth restriction so not recommended.

9.3: Fetal heart assessment by sonicaid/ fetoscope at each visit.

9.4: Fetal movement counts is reassuring for mothers but not sensitive. If woman reports with less fetal movements initiate fetal surveillance by ultrasound.[5]

9.5: In women with non-severe hypertension, ultrasound assessment of fetal well-being and growth (fetal biometry measured using Head circumference HC, Abdominal circumference AC, Femur length FL), umbilical artery Doppler velocimetry (by expert operator to detect reduced, absent or reverse flow) at diagnosis and if normal, repeat every 2-4 weeks.[29]

9.6: CTG offered after 30 weeks where clinically indicated (decreased fetal movements, vaginal bleeding, sudden abdominal pain, sudden rise in BP, unstable maternal condition.[30] CTG (after 30 weeks) is done at presentation and repeated twice weekly in PE complicated with FGR or more frequently if clinically indicated.

9.7: In women with severe hypertension, ultrasound assessment of fetal well-being and growth (fetal biometry measured using Head circumference-HC, Abdominal circumference-AC, Femur length -FL), umbilical artery Doppler velocimetry (by expert sonologist to detect reduced, absent or reverse flow) at diagnosis, repeat 1-2 weekly.

10. TARGET BP

Target BP recommended is 130 / 85 mmHg.[5]

11. MANAGEMENT OF CHRONIC HYPERTENSION

It is important to manage chronic HTN to prevent adverse maternal, fetal and neonatal outcomes (Table-I).

Table-I: Chronic Hypertension complications.

Pre eclampsia 17-25% (31–34)
Fetal growth restriction with superimposed pre-eclampsia 41%
Fetal growth restriction without superimposed preeclampsia 21%(35)
Placental abruption 1.5%(36)
Preterm delivery 12-34%(31)
Intrauterine demise 0.8% (37)
Neonatal deaths 0.5% (37)
Caesarean section rate 50-70% (35)

11.1 Pre pregnancy counseling and advice

11.1.1: Advice women with chronic hypertension to keep BP < 130/85 mmHg.

11.1.2: Inform women with chronic hypertension that adverse pregnancy outcomes are more common in women with co-morbidities (mainly renal). Women with chronic hypertension should be seen by multi-disciplinary team. Offer Ophthalmic, renal and cardiac status assessment.

11.1.3: Educate women to optimize weight, adopt healthy life style with regular exercise and reduced salt intake.

11.1.4: Review medication, stop Angiotensin-converting enzyme inhibitors (ACE), Angiotensin

receptor blockers (ARBs), Renin inhibitors, Mineralocorticoid receptor antagonists (are teratogenic). Switch to safer anti-hypertensives (Labetalol, Nifedipine or Methyldopa).

11.2 Antenatal Care

11.2.1: All women with chronic hypertension must book early, by 12 weeks of pregnancy.

11.2.2: Medication are reviewed and safe antihypertensives initiated at the earliest.[5] Labetalol, Nifidepine and Methyldopa are safe in pregnancy.[5] ACE inhibitors, ARBs are avoided because of risk of nephrotoxicity in fetus. Thiazides diuretics should not be used as it may restrict the natural plasma volume expansion of pregnancy.[5]

11.2.3: Women with chronic hypertension should maintain home record of BP with automated device. Objective of monitoring is to identify severe hypertension and superimposed early onset PE.

11.2.4: Clinical Assessment

History: Detailed history about duration of hypertension, control of BP, medication being used, comorbidities (Diabetes, Renal disease, SLE, Autoimmune disease), Poor lifestyle (sedentary lifestyle, smoking, poor diet, increased salt intake).

Examination: Estimate BMI, BP by automated/ mercury apparatus, auscultate heart and lungs, evaluate for cardiac dysfunction (raised JVP, basal crepts in lungs) and obstetric exam. Refer for fundoscopy.

Investigations: dipstick testing for proteinuria as screening and if found to be >+1, urine protein creatinine ratio/Albumin creatinine ratio should be obtained as baseline to quantify severity of proteinuria and to serve as reference for future diagnosis of super imposed preecalampsia.

Renal function tests to test for electrolytes, creatinine, and uric acid.

FBC,Renal ultrasound, ECG, Echocardiography to assess end organ damage.[39]

Offer women 75 gm 2 h oral glucose tolerance test.

Offer first trimester dating ultrasound to estimate period of gestation as planned early birth may be required and to rule out any malformations.

11.2.5: Offer expert medical consultation if Cushing syndrome, autoimmune disease, or Pheochromocytoma is suspected.[3]

11.3.Fetal Asessment and Monitoring

11.3.1: Fetal surveillance by Fetal kick charts starting at 28 weeks which is reassuring for mothers. If FM are less than 10 in 12 hours ,then initiate further testing by ultrasound and Doppler studies.

11.3.2: Symphysio-fundal height, serial growth ultrasounds from 28 weeks and repeated at 2-4 weeks interval, depending about the fetal condition.[3]

11.3.3: Offer umbilical artery Doppler at 28, 32 and 36 weeks in women with Chronic hypertension and twice weekly if there is evidence of fetal compromise and superimposed preeclampsia.[5]

11.4.Management

11.4.1: Offer pharmacological treatment in blood pressure less than 140/90 mmHG in two occasion admission/referral to a tertiary care hospital in women with severe hypertension (BP of 160/110 mm HG) or symptoms and signs of super-imposed preeclampsia, clinical or ultrasound evidence of fetal compromise.

11.4.2: Once maternal and fetal condition is stabilized expectant management can be continued till 37 weeks gestation.

11.4.3: Offer multidisciplinary input especially for women with secondary hypertension.

11.4.4: Offer corticosteroids and Magnesium sulphate for fetal lung maturity and neuroprotection if indicated according to standard protocols mentioned in guideline.

11.4.5: Consider repeating investigating in 24 -48 hours depending upon the severity of super imposed pre eclampsia. (FBC, RFTs, LFTs, spot urinary protein creatinine ratio).

11.4.6: Assessment of fetal compromise should include ultrasound assessment of fetal growth and umbilical artery Doppler. CTG should be advised if clinically indicated.[5]

11.4.7: ICU /HDU care should be offered to women with severe hypertension, Eclampsia, symptoms of

severe preclampsia, hyperreflexia, HELLP syndrome, impaired biochemical investigations, falling oxygen saturation requiring ventilation, cardiac failure, severe oliguria.

11.5: For delivery, intra partum care, post natal care, long term care, contraception, Refer to section 16,17,21, 22 of this guideline.[3,5,9,32]

12. MANAGEMENT OF GESTATIONAL HYPERTENSION

Pregnancy outcomes are generally good in women with gestational hypertension. However, 50% women with early onset gestational hypertension develop preeclampsia. It is difficult to predict who will develop PE so there is a need for close follow up.[10] Ideally all asymptomatic women with mild to moderately elevated BP and no proteinuria should have the appropriate laboratory investigations to exclude maternal organ dysfunction to exclude PE.

12.1 Antenatal Care

12.1.1: Women with gestational hypertension should have antenatal visit 1 to 2 weekly depending upon BP control. Objective of antenatal visits is early identification of PE and monitoring of fetal growth.[40,41]

12.1.2: Maternal assessment

Review home BP record and medication at each antenatal visit.

Enquire about symptoms at each visit At each visit do urine dipstick test for proteinuria. If it is positive, quantify with spot urine PCR.

Investigations- complete blood count, serum creatinine, serum uric acid, Liver function tests are done every 2-4 weeks.

Consider diagnosis of PE if new onset proteinuria and/or features of multi-organ involvement are recognized in a woman with gestational hypertension

12.1.3 Fetal Assessment

Offer anomaly scan at 20-22 weeks of gestation with uterine artery pulsatility index (PI) by trained sonologist.

From 28 weeks, assess symphysio-fundal height (serial assessment) at each visit.

Fetal growth scan should be done at 2 week interval starting at 28 weeks.

In case of suspected fetal compromise, offer ultrasound for biophysical profile and Umbilical artery Doppler.

12.1.4: Offer antihypertensive treatment if BP is > 140/90 mmHg.

Drug of choice is labetalol, followed by Nifedipine and Methyldopa.

(Table-II for dosage).

Table-II: Maternal History

Extremes of maternal age <18 and > 40 years or older, Nulliparity
Inter pregnancy interval of more than 10 years or less than 2 years
Family history of pre-eclampsia in a first degree relative
Multiple pregnancy,
Gestation at presentation,
Multifetal pregnancy
Previous history of pre-eclampsia or gestational hypertension
Preexisting vascular or kidney disease

Aim for target BP <135/85 mmHg.

Offer CBC, RFT and LFT. Get urine dipstick for proteinuria. If it is positive, quantify proteinuria with urine PCR.[10]

In case of severe gestational hypertension (BP >160/110 mmHg), offer admision to tertiary care. Assess for signs and symptom of PE and fetal compromise. First stabilize maternal BP with multidisciplinary input.[42] Admit to ICU /HDU/obstetric critical care if has preeclampsia with severe features, HELLP syndrome, falling oxygen saturation requiring ventilation, evidence of cardiac failure, severe oliguria, impaired biochemical investigations.[10]

Women in whom delivery is contemplated before 34 weeks, offer steroid cover for fetal lung maturity (Table-III) and magnesium sulphate for fetal neuroprotection (Table-IV).

Table-III: Investigations (Section 7).

FBC (thrombocytopenia <150,000/ul) and blood film for hemolysis (schistocytes, or red cell fragments)[44]
LFTS (raised ALT (over 70IU/lit), raised LDH (> 600 MIU/L), raised Bilirubin
RFTS (Serum creatinine>90 umol/l)[44]
Dipstick testing as a screening test for proteinuria and if proteinuria is evident on dipstick testing,offer a spot urinary protein creatinine ratio.
Spot urinary protein creatinine ratio >30mg/mmol is significant proteinuria.[6]
APTT/PT should not be done routinely in the absence of thrombocytopenia.
Do Obstetrical ultrasound for fetal wellbeing, fetal growth, amniotic fluid index and Umbilical artery Doppler velocimetry at time of presentation.
Uric acid level of more than 6 mg /dl is cut off value in preeclampsia[6]
Serum uric acid is not considered to be a diagnostic criteria for preeclampsia[6,15] and should not considered for delivery.

Table-IV: Red Flag signs

1. Proteinuria
2. Other maternal organ dysfunction, including:
   Acute kidney injury (AKI) (creatinine ≥90 µmol/L; 1 mg/dL)
   liver involvement (elevated transaminases e.g. ALT or AST>40 IU/L) with or without right upper quadrant or epigastric abdominal pain)
3. Neurological complications (examples include eclampsia, altered mental status, blindness, stroke, clonus, persistent visual scotomata)
4. Haematological complications (thrombocytopenia – platelet count below 150,000/µL, DIC, hemolysis)
5. Decreased urine output(Less than 80ml over 4 hours)
6. Uteroplacental dysfunction (such as fetal growth restriction, abnormal umbilical artery Doppler wave form analysis, or stillbirth)

For delivery timing, intra partum care, post-partum care and long term care refer to sections 16, 17, 21 and 22.

12.1.5 Discharge Plan:

Measure BP daily for the first 2 days (24–48 hours) after birth and keep target BP of 130/80 mmHg.[40] Woman can be discharged home if BP is <140/90 mmHg.[42] Counsel women for the risk of gestational hypertension in future pregnancy is 16 and 47% and risk of preeclampsia is 2-7 %.[41]

Educate couple about importance of family planning, optimization of maternal health and need to follow up.[43]

Woman should be guided to use automated BP apparatus to check BP daily at home.

Follow up at 1 week after delivery to assess BP control. Adjust medication if required for BP control.[41]

13. MANAGEMENT OF PREECLAMPSIA

Preeclampsia is new onset hypertension with multiorgan involvement presenting after 20 weeks. The disease tends to be severe with a progressive unpredictable course, requires enhanced antenatal care and monitoring as the condition can change rapidly.

The role of pharmacotherapy is to prevent the complications arising as a result of multiorgan involvement and to gain time for fetal maturity in pregnancies less than 37 weeks of gestation. Delivery is the cure and can be considered even at earlier gestation if there is maternal compromise.

The mainstay of antenatal care is earlier identification of pregnancies progressing to severe preeclampsia. Aim is to control hypertension, prevent seizures, optimize fetal outcomes by administration of steroids and MagSO4, planning for delivery and intensive postnatal care.

This section of the guideline will provide information to all HCPs regarding counseling, risk stratification, triaging of patients with or without severe features, home/out patient monitoring, admission criterion in patients with severe features and monitoring in hospital, delivery planning, post natal stay in hospital and postnatal follow up.

13.1.Education and Counseling

All patients presenting with preeclampsia are counseled for following:

13.1.1: Red flag symptoms-headache, epigastric pain vomiting, blurring of vision, swelling of body, reduced fetal movements or abdominal pain associated with vaginal bleeding.

13.1.2: Need for admission to hospital for monitoring of maternal and fetal.

13.1.3: Frequent antenatal visits for early detection of complications.

13.1.4: Regular home BP monitoring, reporting to hospital if red flag symptoms develop or BP worsens.

13.1.5: Need for early delivery in case of maternal or fetal compromise and consequent admission of baby to NICU.

13.1.6: Need for admission to critical care.

13.1.7: Need for postnatal visits which can be at local health center/district hospital/family doctor for 6 weeks and a tertiary care hospital if BP has not settled in 3 months to investigate other causes of hypertension.

13.1.8: Risk of recurrence of preeclampsia in future pregnancies is 16-23%.[5]

13.1.9: Risk of future cardiovascular disease is increased approximately 1.5-3 times.[5]

13.1.10: Healthy life style.

13.2 Antenatal Care

13.2.1: Take detailed history (Table-II), perform examination at first and each subsequent antenatal visit to triage.

13.2.2: Assess Symptoms [5,16,44]

- Swelling of face, hands, body or rapid weight gain.
- Persistent headache, visual disturbances, blindness.
- Irritability, altered mental status, stroke.

- Epigastric pain or right upper quadrant pain with nausea and vomiting.
- Chest pain or dyspnea.
- Loss or reduced fetal movements.
- Vaginal bleeding with abdominal pain.

Red Flag signs (Table-III), Signs of severe pre-eclampsia (Table-V).

Table-V: Signs of severe pre-eclampsia.

Sustained systolic blood pressure of >160 mmHg and diastolic of >110 mm HG
A new and persistent rise in creatinine >90 micromol/litrer / >1.0 mg/ ml
Elevated ALT or AST > 40 IU with or without right upper quadrant pain or epigastric pain
Platelet count < 100000/microlitre is a feature of severe pre-eclampsia.
Uteroplacental dysfunction (Fetal growth restriction, abnormal umbilical artery doppler waveform with increased resistance, absent or reversed end diastolic flow)
Signs of impending pulmonary oedema or oxygen saturation of <90%.
Signs of impending eclampsia (sustainable clonus, evidence of hyperreflexia)

13.2.3: Examination

- Measure height & weight, BMI, BP should be checked twice (4 hours) in standard way by a calibrated and reliable device.
- Examine for pitting oedema in feet and non-dependent areas such as face, hands and abdominal wall.
- Auscultation of heart for any cardiac dysfunction and chest to exclude pulmonary oedema. Measure oxygen saturation if pulse oximeter is available.
- Abdominal examination for liver tenderness in right upper quadrant
- Clinical assessment for sustained ankle clonus > 3 beats.[6]
- (Fundoscopy for hypertensive changes associated with retinal vasospasm and papilledema
- Obstetrical examination: Assess Symphysiofundal height and auscultate for fetal heart.

13.2.4: Investigations:[15,44,45] (Table-III)

13.3.Triage

Triage patient, according to disease severity for hospital admission/outpatient care. Offer first consultation by an experienced obstetrician once diagnosis of PE has been established and plan of antenatal care should be discussed and documented.

13.3.1: Consider asymptomatic women with mild features of PE to be treated on outpatient basis keeping in view the compliance for antenatal visits, financial and social constraints and hence should be individualized.

13.3.2: Offer hospitalization for observation and monitoring in antenatal ward for symptomatic PE or if there are concerns for fetal well-being.

13.3.3: Admit women with severe PE or impending eclampsia to obstetric critical care/HDU for stabilization and early delivery.

13.3.4: Offer referral/ in utero transfer to a tertiary care hospital in the presence of the Red Flag Signs if working in a district or secondary care hospital.

13.3.5: Offer Magnesium sulfate for seizure prophylaxis before referral/in utero transfer to tertiary care.[5]

13.4.Antenatal Care Plan for Pre-Eclampsia without Severe Features

13.4.1: Evaluation in antenatal care clinic Antenatal care visits are planned every 1-2 week for asymptomatic patients with well controlled blood pressure of 135/85 mm HG or less.

13.4.2: At every antenatal visit, check BP, evaluation of symptoms, obstetrical examination and investigations (Table-III).

13.4.3: Fetal heart auscultation at every appointment and fetal kick chart for maternal reassurance only but has insufficient evidence.[47] Consider CTG if woman reports a change in fetal movement.

13.4.4: Offer ultrasound every 2 weeks for fetal growth assessment.

Consider Umbilical artery Doppler in case of fetal compromise / FGR.[5]

13.5 Blood Pressure Control/ Antihypertensives

13.5.1: Aim for target BP 135/85 mmHg or less.[1] Care should be taken not to lower blood pressure too much as this will negatively affect placental perfusion and compromise fetus.

13.5.2: Home BP monitoring once a day.

13.5.3: Offer antihypertensive if BP is > 140/90 on two occasions six hours apart.[5]

13.5.4: Offer labetalol, followed by Nifedipine and Methyldopa.[46,47,5]

Dosage: Labetelol (100-2400 mg daily), Nifedipine (20mg-60 mg daily), and Methyldopa (250-750 mg 8 hourly).

13.6.Fetal monitoring in PE without severe features

13.6.1: Assess fetal well being by ultrasound for fetal biometry, amniotic fluid (AFI) and umbilical artery Doppler. Diagnose fetal growth restriction if EFW <10th centile or abnormal UA Doppler.[48]

13.6.2: Offer assessment of fetal growth , amniotic fluid volume, and uterine artery Doppler at two weekly intervals if initial assessment was normal and no evidence of maternal or fetal compromise till 37 weeks.[5,44]

13.7 Antenatal Care of Pre-Eclampsia with Severe Features of Pre-Eclampsia

13.7.1: Offer admission in HDU/Obstetric critical care if BP >160/110 mmHg, or patient develops RED FLAG symptoms and signs (Table-IV and Table-V).

The aim of management for hospitalized patients with severe PE is: stabilization of BP, prophylaxis of seizures, maternal and fetal monitoring and early delivery if any maternal or fetal compromise is evident.

13.7.2: Consider continuous monitoring of blood pressure by electronic monitors. In case electronic monitors are not available BP should be checked every 15-30 minutes until BP is <160/100 mmHg, then every six hours until the patient is stabilized.[5]

13.7.3: Antihypertensive in PE with severe features BP of >160/110 mmHg requires prompt treatment because of risk of cerebral haemorrhage and eclampsia.[5,49–51]

13.7.4: Use oral/IV Labetalol or Oral Nifedipine in controlling BP in pregnant women with severe.[52,53] Intravenous labetalol dose (Table-VI). Intravenous Hydralazine dose (Table-V). Nefidipine dose (Table-VIII). Seizure prophylaxis (Table-IX).

Table-VI: Intravenous Labetalol dose.

Dosage Regimen of Intravenous Labetalol	
Intravenous Labetalol	Labetalol Infusion
20ml (1 ampoule) =100mg 2ml=10mg Give 10 to 20mg IV then 20 to 80mgevery 20 to 30minutes, maximum of 300mg	20ml (1 ampoule)=100mg Infusion to be given @1-2mg/min(Level II) Add 200mg labetalol (40ml) to 60ml of NaCl 0.9% to make 100ml. Label ''labetalol 2mg /ml in NaCl 0.9% (labetalol 200mg /100ml)

Table-VII: Intravenous Hydralazine dose.

Dosage Regimen of Intravenous Labetalol	
Intravenous Hydralazine	Hydralazine infusion
Dilute 20mg (1 ampoule) hydralazine in 20ml of water for injection Administer 5mg (5ml) Hydralazine as an IV bolus Monitor and record BP every 10 minutes Perform continuous CTG monitoring If after 20 minutes severe BP persists, Administer second dose of 5 mg (5ml) Hydralazine as an IV bolus If after 20 minutes severe BP persists Administer third dose of 5 mg (5ml) Hydralazine as an IV bolus If severe hypertension persists after 3 boluses of IV hydralazine, start hydralazine infusion	Make a solution of 80 mg (4 ampoules) hydralazine in 90 ml 0.9% N/S. Commence hydralazine infusion via infusion pump/ dial flow at a rate of 5 mg/hr , i.e 30ml/hr increase infusion by 10 ml every 30 minutes to a maximum of 90 ml/hr.(i.e 15mg/hr), aiming for systolic BP 140-160mmHg and diastolic BP 90-100mmHg

Table-VIII: Nifedipine dose.

Dosage Regimen of Nifedipine	
Starting Dose	Maximum Dose
Tablet Nifedipine 10mg TDS, can be increased up to 20mg three to four times daily	120mg/day
Extending Release Tablet Nifedipine: 30 to 90mg orally once a day	120mg/day

Table-IX: Seizure prophylaxis by Magnesium sulphate[54].

Loading Dose	Maintenance Dose
Intravenous dose of 4g slowly over 20min Using a 20 mL syringe, draw 4g of MgSO4 50% (8 mL). Add 12 mL sterile water or saline to make a 20% solution.	Maintenance dose of 1-2g every hour given by an infusion pump Add 4g MgSO4 in 200ml N/S IV infusion@ 1g per hour (i.e. 50ml/h) until 24 hours after delivery or since the last fit

13.7.5: Offer Prophylaxis with magnesium sulphate where there are signs and symptoms of Impending eclampsia (Table-IX).[54] MgSO4 toxicity (Table-X).

Table-X: MgSO4 toxicity[54].

Measurement of serum MgSO4 levels is not necessary unless signs of toxicity

1. Signs of MgSO4 toxicity
   Respiratory rate <10/min or Sao2 <92% (24- 30mg/dL)
   Muscle paralysis (9.6-12mg /dl),
   Reflexes absent (9.6-12mg/dl)
   Urine output <30ml/hour
2. If toxicity suspected
   Stop infusion
   Take sample for MgSO4 level
3. Treatment of MgSO4 toxicity:
   Administer Calcium gluconate ,10ml in 100 ml normal saline IV over 10-20 minutes

**The therapeutic reference range for serum Magnesium in adults is 5-8 mg/dl (4-7mEq/L)[10]*

13.8.Fluid Balance

13.8.1: In women with severe pre eclampsia, limit IV fluid to 80ml/hour, unless indicated otherwise.[44] Accurate measurement of fluid intake and output. Fluid overload can lead to maternal death.

13.8.2: Fluids should be given by infusion pumps or dial flows.

13.8.3: Do regular auscultation of lungs in patients on IV fluids to detect pulmonary edema early.

13.8.4: Diuretics should not be used in the absence of pulmonary edema.

13.8.5: Urinary output should be measured hourly by an in dwelling urinary catheter.

13.8.6: Do not use volume expansion unless Hydralazine is used.[5]

13.8.7: Fluid administration should be monitored by intensivist.

13.8.8: Offer mechanical thromboprophylaxis by TEDS stockings.[55]

13.9.Fetal Monitoring with FGR

13.9.1: If the umbilical artery Doppler demonstrates increased resistance (Pulsatility Index >95th centile), the ultrasound surveillance by Doppler is recommended twice weekly.

13.9.2: If there is absent end-diastolic flow in the umbilical artery (AEDF) prior to 34 weeks' gestation monitoring by daily UA Doppler, amniotic fluid volume assessment and CTG are recommended. These women should be discussed with consultant daily.

13.9.4: If there is reversed end-diastolic flow in the umbilical artery (REDF) expedite delivery with arrangements for NICU or in utero transfer.

13.9.5: Prenatal corticosteroids for fetal lung maturation should be considered between 28 ± 0 and 34 ± 0 weeks gestation, but may be given up until 38 ± 0 weeks in cases of elective delivery by Caesarean section.[56,57] Multiple courses of steroids should not be administered.

13.10. Delivery

Timing of birth without severe features of PE:

13.10.1: From 34-36 +6 weeks of gestation, pro-longing the pregnancy is considered for fetal benefit, as long as the maternal assessments are satisfactory and there is no clinical or laboratory evidence of maternal compromise.[5]

13.10.2: At 37 weeks or more, delivery is recommended. Birth should be initiated within 24-48 hours of hospitalization.[50,5]

Timing of Birth with Severe Features of PE:

13.10.3: Consider early delivery irrespective of gestation, if there are concerns regarding maternal wellbeing such as uncontrolled hypertension despite optimal treatment, BP of >160/110 mm HG, HELLP Syndrome, deteriorating blood tests, reduced oxygen saturation less than 90%, or signs and symptoms of placental abruption, impending eclampsia or abnormal velocimetry.

13.10.4: At <26 weeks of gestation/pre viable, delivery is advised to avoid serious maternal morbidity and mortality after counselling and informed consent.[58]

13.10.5: At <34 weeks of gestation if delivery is planned because of maternal or fetal compromise, appropriate NICU services should be ensured in the hospital or in utero transfer arranged after discussion with neonatologist. Mg SO4 neuroprotection should be offered if delivery is imminent within 24 hours at <32 weeks of gestation,[59] and corticosteroid should be administered according to protocols.

13.11 Labour management: Refer to section 16 of this guideline for Intra partum care

13.12: Post Natal Care Plan

13.12.1: Hospital stay and management plan Advice Women with PE to stay in hospital for 48 to 72 hours because of 40% risk of post natal eclampsia.

13.12.2: BP should be checked 4 hourly during in hospital stay.

13.12.3: Ask for Red Flag Symptoms (Table-III).

13.12.4: Antihypertensive should be started if BP is >150/100 mm HG in women who were not taking anti hypertensives in antenatal period.

13.12.5: In women, who were on antihypertensive, continue if BP is >150/100 mmHG, and consider reducing dosage if BP is <140/90 mmHG.[60,61]

13.12.6: Offer Enalapril in post-natal period with appropriate monitoring of renal function and maternal serum potassium.[62,63] Nifedipine, Atenolol/labetalol/ metoprolol can be safely used in postnatal period.[64-66]

Dosage of Postnatal Antihypertensives (Table-XI)

13.12.7: If BP is not well controlled with one medicine, offer a combination of Nifedipine and Labetelol.[44]

Table-XI: Dosage of postnatal Antihypertensives.[5]
Enalapril initial dose is 5 to 10 mg once daily, usual maintenance dose is 20 mg and maximum maintenance dose is 40 mg daily.
Nifedipine 30 to 60 mg orally once a day maximum of 120 mg per day.
Atenolol 25-50 mg /day maximum to 100 mg /day
Labetalol 100 mg twice daily, maximum of 2400 mg.

13.12.8: If BP is found to be <130/80 mmHg during hospital stay for 72 hours no need to start antihypertensive therapy.

13.12.9: Women on antihypertensive therapy wishing to breast feed should be explained that antihypertensive can pass into breast milk in very low levels, unlikely to have any clinical effects but diuretics and ARBs should be avoided.

13.12.10: Hematological and biochemical investigations should be repeated 48-72 hours after delivery. If investigations are normal do not repeat again. If investigations are outside the reference range, then repeat as clinically indicated.

13.13.Discharge Plan

13.13.1: Discharge women with pre-eclampsia if all of the following criteria are met:

No symptoms of pre-eclampsia.

BP, with or without treatment, is < 150/100 mmHg.

Blood test results are stable or improving.

13.13.2: Home BP monitoring daily at nearby health facility or by health care worker.

13.13.3: Self-monitoring for symptoms: headaches, visual disturbances, nausea, vomiting, epigastric, feeling faint or convulsions.

13.13.4: Report to hospital if BP rises >150/100 mmHg with antihypertensive therapy or symptomatic.

13.13.5: Offer postnatal checkup in hospital at 2 weeks for BP & proteinuria check. Refer women who continue to take antihypertensives for specialist review.

13.13.6: Offer postnatal checkup again to all women with PE at 6 weeks and at 12 weeks. Assess clinically check BP & proteinuria. Advice regarding life style modifications, risk of hypertension and cardiovascular disease in later life. Risk of recurrence in future pregnancies is approximately 1 in 5.[5]

13.13.7: If hypertension/proteinuria persist at 12 weeks postpartum refer to nephrologist.

13.13.8: Offer contraception after discussing women preferences according to MEC WHO.

14. MANAGEMENT OF ACUTE SEVERE HYPERTENSION IN PREGNANCY

Severe hypertension in pregnancy can be life threatening requires prompt treatment and close surveillance. The main aim is to control BP and prevent seizures. Uncontrolled high BP can lead to Myocardial ischemia, heart failure, stroke and acute renal injury. (Figure).

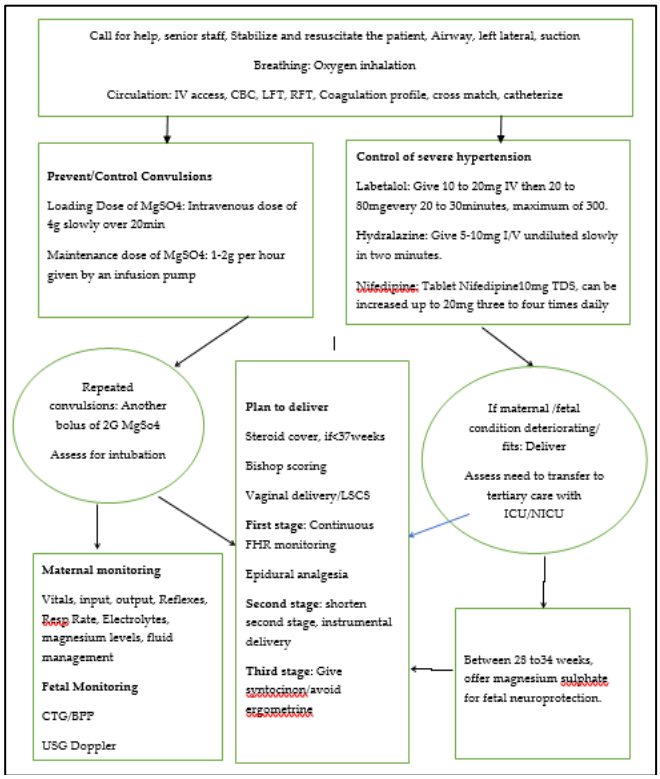

Figure: Algorithm of Emergency management for patient with Eclampsia/Severe preeclampsia/ Severe Hypertension.

14.1 Control of BP

If BP is >160/110 mmHg, admit the patient. Initiate anti-hypertensive urgently within 15 minutes. Use any one of the following to treat severe hypertension

1. Immediate release Oral Nifedipine: 10 mg orally, then 10-20 mg 2-6 hourly. Continuous BP monitoring (or at least every 20 minutes) is encouraged. Max dose: 180mg. Side effects are maternal tachycardia and headaches. Get review by fetal medicine, anesthesia and internal medicine.[4]
2. Labetalol (oral or intravenous) Protocol for IV Labetalol: Give 10-20 mg then 20-80 mg IV every 20 to 30 minutes or administer as infusion 1-2 mg/ minute. Monitor BP. second anti-hypertensive hydralazine is initiated. Max dose: 300mg. Avoid in

Bronchial Asthma, Cardiac disease, Heart failure, Heart block & bradycardia.

3. Intravenous hydralazine: 5-10mg is given IV over 2 minutes then 5-10 mg IV every 20-40 minutes. Alternatively IV infusion 0.5 to 10mg/hour can be used. BP is monitored by electronic monitor or every 20 mins Use upto 500 ml crystalloid fluid before or at the same time as the first dose of intravenous hydralazine,[4] max dose: 20 mg. Risks include maternal hypotension & headaches and Abnormal FHR tracings. If BP remains >160/110, get anesthesia and medical review.

14.2 Monitoring Once BP is Controlled

If BP thresholds are achieved, monitor BP every 15 minutes for 1 hour then half hourly for 1 hour, then hourly for 4 hours. Further monitoring of BP is indivualized.

14.3 Assess for Super Imposed Preeclampsia by Following Investigations

1. Hematocrit
2. Platelet count
3. Creatinine
4. Serum uric acid levels
5. Liver function testing
6. Urine PCR

14.4 Timing of Delivery

If woman is at 34 weeks, and BP does not respond to treatment or woman develops severe PE, then initiate delivery. This is due to high risk of complications including placental abruption, pulmonary edema, eclampsia.[5] If delivery is indicated at earlier gestation, steroid cover for fetal lung maturation and Magnesium sulphate for fetal neuroprotection must be considered.[5]

Delivery is recommended > 37 weeks.

15. INTRAPARTUM CARE

15.1 Timing of Delivery

15.1.1: Delivery plans are individualized tailored to clinical condition, severity of maternal disease and gestational age.

15.1.2: At 37 weeks or more : Irrespective of the type of HDN delivery is recommended. Birth should be initiated within 24-48 hour of seeing the patient.[10] It results in reduction in severe hypertension without an increase in caesarean section rate.[10]

15.1.3: From 34 to 36 +6 weeks of gestation: prolonging the pregnancy is considered to improve fetal prognosis, as long as the maternal assessments are satisfactory and there is no clinical or laboratory evidence of maternal compromise.[10]

15.1.4: Consider early delivery irrespective of gestation, in cases there are concerns regarding maternal wellbeing such as uncontrolled hypertension despite optimal treatment, BP of >160/110 mm HG, HELLP Syndrome, deteriorating blood tests, reduced oxygen saturation less than 90%, or signs and symptoms of placental abruption, impending eclampsia or abnormal UA velocimetry. Delivery should not be delayed for the administration of steroids in late preterm gestations.

15.1.5: At <34 weeks of gestation: if delivery is planned because of maternal or fetal compromise, appropriate NICU services should be ensured in the hospital or in utero transfer arranged. Antenatal corticosteroid (<36 weeks) and Mag SO4 for neuroprotection (if delivery is imminent within 24 hours at gestations <34 weeks) should be offered.[21]

15.1.6: At pre viable gestation (<26 weeks), delivery is advised to avoid serious maternal morbidity and mortality after counselling and informed consent.[18,19]

15.2: Ensure Patient Safety

- Hypertensive disorders pose increased risk to mother and baby
- Ensure presence of multidisciplinary team.[5]
- Delivery plan should be made and documented during antenatal period.

All women with HDP require delivery in a health care facility that provides emergency obstetric and neonatal care while women with maternal complications require delivery in a center capable of providing obstetric critical care. Those with preterm gestations require settings with the highest available level of neonatal care (Table-XII).

Table-XII: Summary: Indications for delivery in women with gestational hypertension- preeclampsia spectrum.

Maternal	Fetal
Gestational age ≥ 37 weeks	Placental abruption
Severe uncontrolled hypertension	Severe FGR
Deteriorating platelet count	
Deteriorating renal function	
Deteriorating liver function	
Persistent neurological symptoms	
Suspicion of HELLP syndrome (Persistent epigastric pain, nausea or vomiting with abnormal LFTs)	
Pulmonary edema	

15.3 Clinical Assessment and Care in Labor

- Assess symptomatology. Check for red flag signs. (Table-I).
- Monitor BP, pulse and respiratory rate.
- In patients with severe hypertension, assess maternal blood pressure on admission, every 15 minutes, until patient is stabilized then every 30 minutes in initial phase of assessment, then 4 hourly if patient remains stable and asymptomatic.[5]
- Check reflexes in severe hypertension
- Monitor fetal heart rate with sonicaid every 15 to 30 minutes
- Do CTG every 2 hours. In women with evidence of abnormal Umbilical uterine Doppler, continuous CTG monitoring is considered if resources are available
- Maintain intake/output record every 4hours
- Check urinary proteins at admission into labor suite.
- Patient should be placed in left lateral position.

15.4 Anti Hypertensives

12.3-1: Oral antihypertensives Labetalol/Nifedipine are given at start of labor

12.3-2: Treat severe hypertension (BP is >160/110 mm Hg) with Nifedipine/Intravenous Labetalol or Hydralazine.

15.5 Fluids

Limit fluid intake to 60 to 80 ml /hour to avoid risks of pulmonary edema. Do not dehydrate a pre-eclamptic women as she is already at risk of acute Kidney injury (AKI).

15.6 Conduct of Labor

- Standard labor and delivery care.
- Use Labor Care Guide to monitor labor. If unavailable, partogram may be used.
- Avoid ergometrine in third stage of labor.
- Aim for Vaginal delivery.
- Offer caesarean section for standard obstetric indications.

15.6.1: Intermittent auscultation is considered every 2 hours in first stage of labour, and after every contraction in second stage of labour if CTG facilities are not available.

15.6.2: If augmentation of labour is undertaken with oxytocin, an oxytocin infusion must be delivered in a concentrated dose via a syringe driver pump or a dialflow.

15.6.3: For pain relief in labour, epidural analgesia is considered.[22,23]

15.6.4: If a caesaren section is performed ,regional anaesthesia is considered if there is no coagulopathy.[24,25]

15.6.5: If a general anaesthetic is used, care should be taken to prevent the hypertensive response to intubation and extubation, and problems of laryngeal oedema.[24,25,26]

Offer active management of third stage of labour, avoiding use of ergometrine or syntometrine.

15.6.7: Consider sending placenta for histopathology and cord blood for PH and lactate levels in cases of FGR if facilities are available.

16. POSTPARTUM CARE

Women with preeclampsia are considered at high risk for developing eclampsia and other preeclamptic complications upto 3 days and rarely six weeks postpartum.[5] Women with HDP are recommended to stay in health care facility for 24 to 48 hours [ref WHO, ISSHP]. Even in busy maternity units with heavy demand for postnatal beds, women with preeclampsia should not be discharged early.

In women with HDP in addition to routine postpartum care, following is recommended.

16.1 Maternal Surveillance: Monitor their BP and clinical condition closely.

16.1.1: Closely monitor women with HDP clinically for symptoms and signs for impending eclampsia (40% of eclampsia occurs postpartum).[5]

16.1.2: Ask about headache, visual disturbances, vomiting and epigastric pain each time blood pressure is measured.

16.1.3: Record BP hourly for first 02 hours in the labor room, then 6 to 8 hourly for 48 hours postpartum, as in-patient.

16.1.4: Recommended target Postpartum BP is <140/90 mmHg.

16.2: Antihypertensive treatment:

16.2.1: Antihypertensive treatment is recommended at BP >140/90.

16.2.2: Medication choices: Nifedipine, Enalapril, Amlodipine alone or in combination with appropriate monitoring of maternal renal function and maternal

serum potassium. For uncontrolled BP, atenolol or labetalol can be added.[5]

16.2.3: Avoid using diuretics or angiotensin receptor blockers in mothers who are breast feeding.[5]

16.2.4: If woman with HDP was taking methyldopa antenatally, stop within 2 days post-delivery and change to an alternative treatment if required.[5]

16.3: Analgesia.

16.3.1: Recommend Acetaminophen for pain relief postpartum.

16.3.2: Avoid Non-steroidal Anti-inflammatory Drugs (NSAIDs) as they may increase maternal BP.[7]

16.4 Laboratory Investigations in Women with Preeclampsia:

- Platelet count, transaminases and serum creatinine are measured 24–48 hours after birth. Repeat testing is required only if levels are not within normal range.
- Urine dipstick at 6–8 weeks postnatal. If proteinuria is detected, review by physician is requested.

16.4.1: Every woman should be given written detailed follow up/documents to provide to the primary health care facility for close follow-up and as reference for future. At discharge all women with HDP are counseled for

- Home BP monitoring
- Self-assessment of symptoms and asked to report to gynae emergency/triage in case of red flag symptoms (headache, visual symptoms, pain abdomen, nausea/vomiting, feeling of fainting, general irritability or convulsions) (Table-IV).
- Continued Postpartum follow up and BP monitoring.[5,10]
- Long term risks. Risk of cardiovascular morbidity& mortality, stroke and hypertension is increased two times.[10]
- Pre pregnancy care in subsequent pregnancy. Recurrence riskof hypertensive disorder in a future pregnancy is 1 in 5.[5,17]
- Reinforce the importance of early booking and antenatal care in the next pregnancy because of risk of recurrent preeclampsia.
- Lifestyle interventions so as to keep BMI between 18.5–24.9 kg/m^2. This can modify risk for long term complications.[5]
- Lifelong follow up as given in section on long term Care.

16.4.2: Recommend checkup at

- 7 days postpartum for women discharged on Anti-hypertensives and
- 6 weeks postpartum.
- 12 weeks postpartum by which time BP, labs and urine analysis should have normalized.

16.4.3: Offer Medical review to:

- All women with HDP with high BP persisting at 12 weeks postpartum
- Women with chronic hypertension a medical review 6–8 weeks after the birth with their GP or specialist as appropriate.
- Offer specialist consultation earlier if BP target is not achieved with 2 anti-hypertensive drugs [guideline group consensus].

17. PRETERM BIRTH

17.1. Antenatal Maternal Corticosteroids

1-Offer a single course of antenatal corticosteroids from 28 to 36 weeks gestation in low resource settings.

2-Use of antenatal corticosteroids enhances fetal lung maturity, reduces intraventricular hemorrhage and neonatal morbidity& mortality at gestation <36 weeks' if delivery is likely within the next 7 days.[1,2]

3-After administering antenatal corticosteroids, maximum benefit is achieved within 2-7 days

4-Repeat dose of antenatal corticosteroids is not recommended.[2,5]

5-Antenatal corticosteroids used are betamethasone and dexamethasone.

6-Betamethasone is preferred to dexamethasone due to greater surfactant production and less neurological side effects.

7-Dosage

- Injection betamethasone is given intramuscular 12mg, two doses 24 hours apart or
- Injection dexamethasone is given intramuscular 6mg every 6 hours, total of 4 doses.

17.2 Magnesium Sulphate

1. Offer intravenous Magnesium sulphate from 28 to <34 weeks gestation for neuroprotection where preterm birth is likely within 24 hours.[10]

2. Dose is 4 gm in 20 ml N Saline as infusion given over 30 minutes, then 1gm per hour till delivery.[5]

18. NEONATAL CARE

Essential and routine neonatal care to be provided according to gestational age and condition at birth.

19. BREAST FEEDING

13.3.1: Encourage all women with HDP to breast feed.

13.3.2: Counsel woman that antihypertensive medicines can pass into breast milk in small amounts.

13.3.3: Advise women with HDP to monitor their babies for drowsiness, lethargy, pallor, cold peripheries or poor feeding.[17]

20. CONTRACEPTION

1. Counseling for contraception should be done during the antenatal care. Contraceptive plan should be endorsed on the antenatal card and implemented with consent postnatal in each woman before she leaves the health care facility.
2. If missed then when she comes back at 6 weeks postpartum or for infant immunization or family planning consultation.
3. All pregnancies in a woman with HDP should be planned at optimized health status with well controlled BP.
4. Use WHO medical eligibility criteria to guide contraceptive choices
5. Link https://srhr.org/mecwheel/
6. Long term reversible contraception-LARC is encouraged with consent of the woman. Copper IUD, Levonorgesteral IUS, Progestogen implants may be initiated in the immediate postpartum period to ensure compliance. Progesterone only pills are safe options in women unwilling for LARC.
7. If BP is 160/100 mmHg or more, combined hormonal contraceptive and injectable progestogen must be avoided.[10,17]
8. Advise women who have had preeclampsia to plan family in the next 2 to 4 years, as the likelihood of recurrence increases with an interpregnancy interval greater than 10 years.

21. LONG TERM CARE OF WOMEN WITH HDP

21.1: Women with HDP in LMIC are often lost to follow up, remain unaware and book in subsequent pregnancy with high BP and evidence of end organ damage.[67] HDP is associated with long term health problems. Coronary heart disease (CHD) is the leading cause of death for women and is increasing in younger women aged 35 to 54 years.[10,7,17] Women with history of PE are four times more likely to develop high BP, twice more prone to have heart disease, diabetes, stroke, renal disease and eye problems.[68]

21.2: Following are recommended at six weeks postnatal visit:

21.2.1: Health Education and Counseling

a. Pregnancy presents a window of opportunity to the HCPs to educate women with HDP about the associated long term risks. Advice women that they are at increased risk of CHD, stroke, T2DM, Renal disease, venous thromboembolism and death as compared to normotensive women.
b. Emphasize the immense value of lifestyle modification in preventing them.
c. Better understanding of the disease will lead to greater compliance for follow up, treatmentand prime the patient for life-long care of her health.

21.2.2: Lifestyle Interventions.[69]

Following practical lifestyle recommendations are offered:

- Adequate Physical activity. Exercising lowers the risk for pre-diabetes and type 2 diabetes (T2DM). Recommend to walk for 30 minutes five times a week and do muscle-strengthening exercises two to three times a week.
- Heart healthy eating habits – Diet rich in fiber vegetables and fruits with avoidance of fried and sugary snacks. This will reduce the risk of heart disease, stroke, and diabetes.
- Optimize weight. Maintain BMI between 18 and 25. A BMI greater than 25 may increase the risk for heart disease.[70]
- Stop active and passive smoking. Tobacco damages blood vessels and raises blood pressure.[71]

21.3: Regular Follow up

6.3-1: All women with HDP should be reviewed at 3 months postpartum to ensure that BP, urinalysis, and any laboratory abnormalities have normalized. If proteinuria or hypertension persists, then referral to physician for further investigations to rule out secondary causes of hypertension should be initiated.

6.3.2: All women with HDP are advised regular long term follow up with obstetrician and Physician.

21.3: Recommend regular BP checks every three to six months for life. Explain that healthy blood pressure is 120/80 mm Hg or lower.[69] Advise to consult physician if BP above 130/90 mm Hg.[72]

21.3.1: Counsel that annual BP &medical checkups with their HCP and annual Lab tests are essential for early problem identification and intervention.

21.3.2: Educate about blood tests to be done annually with target values.[72]

Fasting Blood Glucose (FBG). High BP raises the risk for T2DM.

FBG levels to be between 95-126 mg/dl.

Lipid Profile annually. Theoptimal levels are:

- Total cholesterol: less than 200 mg/dl
- Triglycerides: less than 150 mg/dl
- LDL (bad cholesterol): less than 100 mg/dl
- HDL (good cholesterol): more than 50 mg/dl.[73]

21.3: Advise contraception according to WHO Medical eligibility criteria so that every pregnancy is planned.[74]

21.3: Recommend to seek pre-pregnancy care to ensure BP control, correct medicine choices and optimization of general health, hence improving pregnancy outcomes and avoiding preventable maternal morbidity and mortality.

21.3: Recommend to book early and take Aspirin in future pregnancy. Counsel women with preeclampsia (PE) that risk of developing PE is 15% and gestational hypertension is 15% in a subsequent pregnancy; In gestational hypertension risk of PE is 4% and gestational hypertension 25% in a future pregnancy.[5]

22.Pre Conception Care

Encourage woman with Chronic HTN or past history of HDP to report in preconception clinic.[5,6,41]

1. **Offer Counseling**[41]**:** Educate woman about the
   - Pregnancy risks of chronic hypertension and the potential interventions to minimize these risks,
   - Anticipated course of pregnancy,
   - Need for heightened maternal and fetal surveillance,
   - Need for more frequent obstetric visits
   - Need for possible early delivery.
   - Need for referral to a tertiary care during pregnancy if required
2. **Evaluate for secondary causes of hypertension:** Refer younger women age <30 years with no family history of hypertension to medical specialist for evaluation of cause.[41]

3. Evaluate for end-organ dysfunction: Retinopathy, nephropathy.[5,41]

- **Renal** Evaluation**: Serum** Creatinine Urine protein/creatinine ratio
- Cardiac **evaluation**: Baseline cardiac evaluation by echocardiography/twelve lead electrocardiogram
- Ophthalmic review- Fundoscopy
- Retinoscopy

4. Assess for comorbidities: Diabetes, Obesity, renal disease, SLE and autoimmune disorders. The comorbidities increase the risk of still birth, fetal growth restriction, intra uterine fetal demise and maternal morbidity.

5. Review medication.[5,6,41,51,75]

5.1 **Antihypertensive Treatment:** optimize blood pressure control and shift to safer antihypertensive drugs.

Advise to stop: Angiotensin-converting enzyme (ACE) inhibitors

Angiotensin II receptor blockers (ARBs) (increased risk of congenital abnormalities :renal dysgenesis and calvarial hypoplasia, fetal growth restriction and oligohydramnios) Thiazide or thiazide-like diuretics (increased risk of congenital abnormalities and neonatal complications).

Offer alternative antihypertensive treatment with safer pregnancy safety profile for planned pregnancy: Labetalol/ Nifedipine/Methyldopa.

5.2 Stop statins

6. **Offer Lifestyle interventions:** Preconception weight loss reduces the risk of developing preeclampsia in overweight and obese patients.
7. Advice to women about–weight management; exercise; healthy eating; lowering the amount of salt in their diet, cessation of smoking & alcohol.
8. Preconception Folic Acid supplementation

22. RECOMMENDATIONS

23. FUTURE RESEARCH RECOMMENDATION

1. To find out prevalence of chronic hypertension, gestational hypertension, preeclampsia and

eclampsia in women of reproductive age in Pakistan.

2. To find out the sensitivity and specificity ofscreening and recommended risk predictive model for prediction of preeclampsia in women of Pakistan.
3. To identify strategies that will enhance the proportion of women reporting before 16 weeks (Women in LMIC do not usually seek antenatal care before 20 weeks) so as to employ screening and implement aspirin prophylaxis and calcium supplementation before 16 weeks.
4. For women at risk of preeclampsia, does the use of 150 mg Aspirin, compared with the use of 75 mg Aspirin, have greater benefit for maternal and perinatal outcomes?
5. For women at risk of preeclampsia, does the use of aspirin earlier than 12 weeks' gestation, compared with the use of aspirin from 12-16 weeks' gestation, is associated with better maternal and perinatal outcomes?
6. For women at risk of preeclampsia, does adjusting the dose of Aspirin with weight and BMI, have greater benefit for maternal and perinatal outcomes?
7. For women at risk of preeclampsia and on aspirin preventative treatment, does discontinuing aspirin at 36 weeks' gestation, compared with the discontinuing at the time of delivery, reduce the adverse events in the mother or neonate?
8. For women at risk of preeclampsia, does the use of aspirin initiated at > 20 weeks' gestation have the same anticipated beneficial effects for preventing preeclampsia as initiated at <16 weeks?
9. Will the implementation of the SOGP-HDP guidelines impact clinical practices and reduce maternal and perinatal mortality?
10. In women with HDP who need treatment for high blood pressure postpartum, what is the safety and effectiveness of antihypertensive agents in achieving adequate blood pressure control?
11. What percentage of patients with HDP (gestational hypertension and preeclampsia), at 12 weeks followup visit have persistence of hypertension.
12. To find out characteristics of women with chronic hypertension developing pre eclampsia in second trimester for risk prediction (age, parity, BMI, booking BP)

ABBREVIATIONS

Abbreviation Definition

ACOG: American College of Obstetrics and Gynaecology

ACR: Albumin:creatinine ratio

AE: Adverse event

ALT: Alanine aminotransferase

AMSTAR: Assessing the Methodological Quality of Systematic Reviews

ACE: Angiotensin converting enzyme

ACEI: Angiotensin converting enzyme inhibitor

ARB: Angiotensin II receptor blocker

AST: Aspartate transaminase

AUC: Area under the curve

AUROC: Area under the receiver operating curve

BCW: British Columbia Women

BID: Twice a day

BMI: Body mass index

BNF:British National Formulary

BP: Blood pressure

BW: Birthweight

CASP: Critical Appraisal Skills Programme

CEAC: Cost-effectiveness acceptability curves

CCB: Calcium channel blocker

CHIPS: Control of hypertension in pregnancy study

CH(T): Chronic hypertension

CI: Confidence interval

CPR: Clinical prediction rule

CP: Cerebral palsy

CNS: Central nervous system

CrI: Credible interval

CTG: Cardiotocography

CVD: Cardiovascular disease

DBP: Diastolic blood pressure

dL: Decilitre

DTA: Diagnostic test accuracy

EFM: Electronic fetal monitoring

eMIT: Electronic market information tool

FN: False negative

FP: False positive

G: Gramme

GA: Gestational age

GC: Guideline committee

GH(T): Gestational hypertension

GP: General Practitioner

GRADE: Grading of Recommendations Assessment, Development and Evaluation

h, hr: Hour

HBPT: Home blood pressure telemonitoring

HDP: Hypertensive disorders of pregnancy

HDU: High dependency unit

HELLP: Haemolysis, elevated liver enzymes, low platelet count

HR: Hazard ratio, heart rate

HRG: Healthcare Resource Group

HRQoL: Health-related quality of life

HTA: Health Technology Assessment

ICD: International classification of diseases

ICER: Incremental cost-effectiveness ratio

INR: International normalised ratio

IPD: Individual patient data

IQR: Interquartile range

ISSHP: International Society for the Study of Hypertension in Pregnancy

ITT: Intention to treat

IV: Intravenous

K: Number of studies or publications

K4, K5: Korotkoff 4, Korotkoff 5 sounds

LR: Negative likelihood ratio

LR+: Positive likelihood ratio

M: Mean

MACE: Major adverse cardiovascular event

MAP: Mean arterial pressure

MD: Mean difference

MDI: Mental development index

Mg: Milligramme

MID: Minimally important difference

mmHg: Millimetres of mercury

mmol: Millimole

MR: Mean ratio

N, n: Number of participants

N/A: Not applicable

N/C: Not calculable

NGA: National Guideline Alliance

NHS: National Health Service

NICE: National Institute of Health and Care Excellence

NIHR: National Institute of Health Research

NMB: Net monetary benefit

NNH: Number needed to harm

NNT: Number needed to treat

NNU: Neonatal unit

NR: Not reported

NRCT: Non-randomised controlled trial

Ns: Not significant

NST: Non-stress test

OD: Once a day

O:E: Observed: expected

O-E: Observed minus expected

OECD: Organization of economic co-operation and development

ONS: Office for National Statistics

OR: Odds ratio

PCR: Protein:creatinine ratio

PDI: Psychomotor development index

PE: Pre-eclampsia

PICO: Population, intervention, comparison, outcome

PICOTS: Population, intervention, comparator, outcome, timing and setting

PlGF: Placental growth factor

PO: By mouth, orally

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PROMS: Patient-reported outcome measures

PSA: Probabilistic sensitivity analysis

QALY: Quality-adjusted life year

QoL: Quality of life

QUIPS: Quality in prognostic studies

RCOG: Royal College of Obstetricians and Gynaecologists

RCT: Randomised controlled trial

ROBIS: Risk of bias in systematic reviews

ROC: Receiver operating characteristics

RCT: Randomised controlled trial

RR: Relative risk/risk ratio

SACR: Spot albumin creatinine ratio

SBP: Systolic blood pressure

SD: Standard deviation

SE: Standard error

Sens: Sensitivity

SL: Sub-lingual

SFLT-1: Soluble tyrosine kinase 1

SGA: Small for gestational age

SGOT: Serum glutamic oxaloacetic transaminase

SPCR: Spot protein creatinine ratio

Spec: Specificity

SpO2: Oxygen saturation (peripheral)

SOGP: Society of Obstetrics and Gynaecology Pakistan

SR: Systematic review

TA: Technology appraisal

TID: Three times a day

TN: True negative

TP: True positive

µg:microgramme

µmol: micromole

U/L: Units per litre

PCR: Urine Protein Creatinine Ratio

VAS: Visual analogue scale

Wk: Week

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Author's Contribution

SMB: Concept, Design, writing & Drafting initial document, review of literature cirtical review & final editing of document, RR: Draft sections on chronic hypetension and PE findal editing, HA: Draft sections on chronic hypertension and PE final editing, SHT: Draft sections on gestational hypertension, final editing, FW: Drafts section on severe hypertensions, final editing, HY: Drafted sections on investigation for HDP, proteinuria assessment fand fetal well being, final editing, AW: Peer reviewed the whole guidelines docuemnts, contributing to drafting sections on chronic HTN, PE, Severe HTN and long term management of HDP.

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