Introduction

• One of the leading cause of maternal death worldwide

• Second leading cause of maternal death in Iran

• A UK study reported that one-third of severe maternal morbidity was a consequence of hypertensive conditions

• Long-term consequences for women with a diagnosis of hypertension during pregnancy: chronic hypertension and an increase in lifetime cardiovascular risk.

• 8–10% of all preterm births result from hypertensive disorders
درصد مادران فوت شده بر حسب شایعترین علل مرگ مادر

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شایعترین علائم مرگ مادران در ایران بر اساس این تحقیق شامل بیماری قلبی و عفونت بود.

 Sourc: Ministry of Health, Iran
mild, moderate and severe hypertension

• **Mild hypertension**: diastolic BP 90–99 mmHg, systolic BP 140–149 mmHg

• **Moderate hypertension**: diastolic BP 100–109 mmHg, systolic BP 150–159 mmHg

• **Severe hypertension**: diastolic BP 110 mmHg or greater, systolic BP 160 mmHg or greater.
Definition of significant Proteinuria

• More than 300 mg protein in a 24-hour urine collection or more than 30 mg/mmol in a spot urinary protein:creatinine sample

• Two clean catch urine specimens at least 4 hours apart with 2+ proteinuria by dipstick
Definitions

- **Chronic hypertension** is hypertension that is present at the booking visit or before 20 weeks, be primary or secondary.
- **Gestational hypertension** is new hypertension presenting after 20 weeks without significant proteinuria.
- **Pre-eclampsia** is new hypertension presenting after 20 weeks with significant proteinuria.
- **Severe pre-eclampsia** is pre-eclampsia with severe hypertension and/or with symptoms and/or biochemical and/or haematological impairment.
- **Eclampsia** is a convulsive condition associated with pre-eclampsia.
Assessment of proteinuria

• automated reagent-strip reading device, if ≥1+ protein
• use a spot urinary protein : creatinine ratio or 24-hour urine collection to quantify proteinuria
• **significant proteinuria** if the urinary protein : creatinine ratio is greater than 30 mg/mmol or a validated **24-hour urine collection** result shows greater than 300 mg protein.
Reducing the Risk

• Advise women with one high risk factor or more than one moderate risk factor for pre-eclampsia to take 75 mg of aspirin daily from 12 weeks until the birth of the baby.
Reducing the Risk

High risk factors:
• hypertensive disease during a previous pregnancy
• chronic kidney disease
• autoimmune disease such as SLE or antiphospholipid syndrome
• type 1 or type 2 diabetes
• chronic hypertension

Moderate risk factors:
• first pregnancy
• pregnancy interval of more than 10 years
• age 40 years or older
• body mass index (BMI) of 35 kg/m² or more at first visit
• family history of pre-eclampsia
• multiple pregnancy
Diet and Lifestyle

• Diet
  – Do not recommend salt restriction during pregnancy solely to prevent gestational hypertension or pre-eclampsia.

• Lifestyle
  – Advice on rest, exercise and work for women at risk of hypertensive disorders during pregnancy should be the same as for healthy pregnant women.
Reducing the Risk

Pregnant women should be made aware of the need to seek immediate advice from a healthcare professional if they experience symptoms of pre-eclampsia.

- Symptoms include:
  - severe headache
  - problems with vision, such as blurring or flashing before the eyes
  - severe pain just below the ribs
  - vomiting
  - sudden swelling of the face, hands or feet.
When to treat BP

- CEMACE recommends: treat BP above 150/100 urgently
• Other pharmaceutical agents
• **Do not use** the following to prevent hypertensive disorders during pregnancy:
  • nitric oxide donors
  • progesterone
  • diuretics
  • low molecular weight heparin.
• **Do not recommend** the following supplements solely with the aim of preventing hypertensive disorders during pregnancy:
  • antioxidants (vitamins C and E)
  • fish oils or algal oils
  • garlic.
• **Do not offer bed rest** in hospital as a treatment for gestational hypertension.
Treatment of hypertension

• Antihypertensive treatment
  – First line: Labetolol
  – Alternatives: Methyldopa and Nifedipine

• Maximum dose
Maximum Dose

• Labetalol
  – By mouth, initially 100 mg (50 mg in elderly) twice daily with food, increased at intervals of 14 days to usual dose of 200 mg twice daily; up to 800 mg daily in 2 divided doses (3–4 divided doses if higher); **max. 2.4 g daily**

• Nifedipine SR (Slow Release):
  – Dose hypertension and angina prophylaxis, initially 10 mg twice daily adjusted according to response to **40 mg twice daily**

• Methyldopa
  – Initially 250 mg 2–3 times daily, increased gradually at intervals of at least 2 days, **max. 3 g daily**
Antenatal and Postnatal Management and Timing of birth

• Chronic Hypertension

• Gestational Hypertension

• Pre-eclampsia
Chronic Hypertension, Antenatal Management

• keep blood pressure lower than 150/100 mmHg
• Offer pregnant women with target-organ damage secondary to chronic hypertension (for example, kidney disease) treatment with the aim of keeping blood pressure lower than 140/90 mmHg.
• Change angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs) or chlorothiazide to safe antihypertensives
Chronic Hypertension, Timing of birth

• Do not offer birth to women with chronic hypertension whose blood pressure is lower than 160/110 mmHg, with or without antihypertensive treatment, before 37 weeks.

• Offer birth to women with refractory severe chronic hypertension, after a course of corticosteroids (if required) has been completed.
Chronic Hypertension, Postnatal Management

- aim to keep blood pressure lower than 140/90 mmHg
- continue antenatal antihypertensive treatment
- review long-term antihypertensive treatment 2 weeks after the birth.
- If a woman has taken methyldopa to treat chronic hypertension during pregnancy, stop within 2 days of birth and restart the antihypertensive treatment the woman was taking before she planned the pregnancy.
<table>
<thead>
<tr>
<th>Degree of hypertension</th>
<th>Mild hypertension (140/90 to 149/99 mmHg)</th>
<th>Moderate hypertension (150/100 to 159/109 mmHg)</th>
<th>Severe hypertension (160/110 mmHg or higher)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admit to hospital</td>
<td>No</td>
<td>No</td>
<td>Yes (until blood pressure is 159/109 mmHg or lower)</td>
</tr>
<tr>
<td>Treat</td>
<td>No</td>
<td>With oral labetalol* as first-line treatment to keep:</td>
<td>With oral labetalol* as first-line treatment to keep:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• diastolic blood pressure between 80–100 mmHg</td>
<td>• diastolic blood pressure between 80–100 mmHg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• systolic blood pressure less than 150 mmHg</td>
<td>• systolic blood pressure less than 150 mmHg</td>
</tr>
<tr>
<td>Measure blood pressure</td>
<td>Not more than once a week</td>
<td>At least twice a week</td>
<td>At least four times a day</td>
</tr>
<tr>
<td>Test for proteinuria</td>
<td>At each visit using automated reagent-strip reading device or urinary protein : creatinine ratio</td>
<td>At each visit using automated reagent-strip reading device or urinary protein : creatinine ratio</td>
<td>Daily using automated reagent-strip reading device or urinary protein : creatinine ratio</td>
</tr>
<tr>
<td>Blood tests</td>
<td>Only those for routine antenatal care</td>
<td>Test kidney function, electrolytes, full blood count, transaminases, bilirubin Do not carry out further blood tests if no proteinuria at subsequent visits</td>
<td>Test at presentation and then monitor weekly: • kidney function, electrolytes, full blood count, transaminases, bilirubin</td>
</tr>
</tbody>
</table>
Gestational Hypertension, Timing of Birth

• Do not offer birth before 37 weeks to women with gestational hypertension whose blood pressure is lower than 160/110 mmHg, with or without antihypertensive treatment.

• Offer birth to women with refractory severe gestational hypertension after a course of corticosteroids (if required) has been completed.
Gestational Hypertension, Postnatal Management

• continue use of antenatal antihypertensive treatment
• consider reducing antihypertensive treatment if their blood pressure falls below 140/90 mmHg
• reduce antihypertensive treatment if their blood pressure falls below 130/80 mmHg.
• If a woman has taken methyldopa to treat gestational hypertension, stop within 2 days of birth.
Treatment of severe hypertension

- Labetalol (oral or intravenous)
- Hydralazine (intravenous)
- Nifedipine SR (oral).

- Consider using up to 500 ml crystalloid fluid before or at the same time as the first dose of intravenous hydralazine in the antenatal period.

- In women with severe hypertension who are in critical care, aim to keep systolic blood pressure below 150 mmHg and diastolic blood pressure between 80 and 100 mmHg.
Management of pregnancy with pre-eclampsia

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<tr>
<td>Admit to hospital</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
| Treat                  | No                                       | With oral labetalol\(^*\) as first-line treatment to keep:  
\> diastolic blood pressure between 80–100 mmHg  
\> systolic blood pressure less than 150 mmHg  
With oral labetalol\(^*\) as first-line treatment to keep:  
\> diastolic blood pressure between 80–100 mmHg  
\> systolic blood pressure less than 150 mmHg  |
| Measure blood pressure | At least four times a day                 | At least four times a day                      | More than four times a day, depending on clinical circumstances |
| Test for proteinuria   | Do not repeat quantification of proteinuria | Do not repeat quantification of proteinuria     | Do not repeat quantification of proteinuria |
| Blood tests            | Monitor using the following tests twice a week: kidney function, electrolytes, full blood count, transaminases, bilirubin  
|                        | Monitor using the following tests three times a week: kidney function, electrolytes, full blood count, transaminases, bilirubin  
|                        | Monitor using the following tests three times a week: kidney function, electrolytes, full blood count, transaminases, bilirubin  |
pre-eclampsia

• Timing of birth:
• Recommend birth for women who have pre-eclampsia with **severe** hypertension **after 34 weeks** when their blood pressure has been controlled and a course of corticosteroids has been completed (if appropriate).
• Offer birth to women who have pre-eclampsia with **mild or moderate** hypertension at **34+0 to 36+6 weeks** depending on maternal and fetal condition, risk factors and availability of neonatal intensive care.
Pre-eclampsia, Timing of Birth

Timing of birth

Before 34 weeks
- Manage conservatively (do not plan same-day delivery of baby).
- Consultant obstetric staff to:
  - document maternal (biochemical, haematological and clinical) and fetal indications for elective birth before 34 weeks
  - write plan for antenatal fetal monitoring.
- Offer birth (after discussion with neonatal and anaesthetic teams and, if required, course of corticosteroids completed) if:
  - severe refractory hypertension
  - maternal or fetal clinical indication develops as defined in plan.

34\(^{+0}\)–36\(^{+6}\) weeks
- Recommend birth after 34 weeks if pre-eclampsia with severe hypertension, BP controlled and, if required, course of antenatal steroids completed.
- Offer birth at 34\(^{+0}\)–36\(^{+6}\) weeks if pre-eclampsia with mild or moderate hypertension, depending on maternal and fetal condition, risk factors and availability of neonatal intensive care.

After 37\(^{+0}\) weeks
- Recommend birth within 24–48 hours if pre-eclampsia with mild or moderate hypertension.
Management of the second stage of labour

• Recommend operative birth in the second stage of labour for women with severe hypertension whose hypertension has not responded to initial treatment.
Anticonvulsants

- eclamptic fit
- severe pre-eclampsia if birth is planned within 24 hours
  - severe hypertension and proteinuria or
  - mild or moderate hypertension and proteinuria with one or more of the following:
    - symptoms of severe headache
    - problems with vision, such as blurring or flashing before the eyes
    - severe pain just below the ribs or vomiting
    - papilloedema
    - signs of clonus (3 beats)
    - liver tenderness
    - HELLP syndrome
    - platelet count falling to below $100 \times 10^9$ per litre
    - abnormal liver enzymes (ALT or AST rising to above 70 IU/litre).
Administration of magnesium sulphate

• loading dose of 4 g should be given intravenously over 5 minutes, followed by an infusion of 1 g/hour maintained for 24 hours
• Recurrent seizures should be treated with a further dose of 2–4 g given over 5 minutes.
  – Do not use diazepam, phenytoin or lytic cocktail as an alternative to magnesium sulphate in women with eclampsia.
Fluid balance and volume expansion

• Do not use volume expansion in women with severe pre-eclampsia unless hydralazine is the antenatal antihypertensive.
• In women with severe pre-eclampsia, limit maintenance fluids to 80 ml/hour unless there are other on-going fluid losses (for example, haemorrhage).
Corticosteroids for fetal lung maturation

• If birth is considered likely within 7 days in women with pre-eclampsia:
• give two doses of betamethasone* 12 mg intramuscularly 24 hours apart in women
  – between 24 and 36 weeks
  – If birth is by caesarean section, give steroid up to 38 weeks and 6 days
Risk of recurrence of hypertensive disorders of pregnancy

Tell women who had gestational hypertension that their risk of developing:
• gestational hypertension in a future pregnancy ranges from about 1 in 6 (16%) pregnancies to about 1 in 2 (47%) pregnancies
• pre-eclampsia in a future pregnancy ranges from 1 in 50 (2%) to about 1 in 14 (7%) pregnancies.

Tell women who had pre-eclampsia that their risk of developing:
• gestational hypertension in a future pregnancy ranges from about 1 in 8 (13%) pregnancies to about 1 in 2 (53%) pregnancies
• pre-eclampsia in a future pregnancy is up to about 1 in 6 (16%) pregnancies
• pre-eclampsia in a future pregnancy is about 1 in 4 (25%) pregnancies if their pre-eclampsia was complicated by severe pre-eclampsia, HELLP syndrome or eclampsia and led to birth before 34 weeks, and about 1 in 2 (55%) pregnancies if it led to birth before 28 weeks.
urgent advice from a healthcare professional

- severe headache
- problems with vision, such as blurring or flashing before the eyes
- severe pain just below the ribs
- vomiting
- sudden swelling of the face, hands or feet.
Eclampsia

Call for Help

A, B, C
Left Lateral, O2, IV access

MgSo4, 4g
IV>5-10 Minutes
Figure 3.2 Eclampsia box with laminated treatment algorithm attached and showing contents
Cardiac arrest on MgSO4

• Stop MgSo4

• Start ABC and Life Support

• Give IV Ca Gluconate (10ml of 10% solution over 10 Minutes)

• Early recourse to intubation
Post Eclampsia Management

- Mother is the priority

- Don’t try to listen to fetal heart while mother is unstable

- First stabilize then deliver, don’t rush to deliver

- Remember to keep the patient dry (1ml/kg/hr) and control BP (the two killers of pre-eclampsia are pulmonary oedema and stroke)
Antihypertensives

- Aim to keep systolic blood pressure below 150 mmHg and diastolic blood pressure between 80 and 100 mmHg.
- Treat women with severe hypertension who are in critical care during pregnancy or after birth immediately with one of the following:
  - labetalol† (oral or intravenous)
  - hydralazine (intravenous)
    - nifedipine† (oral).
- Consider using up to 500 ml crystalloid fluid before or at the same time as the first dose of intravenous hydralazine in the antenatal period.
Systolic BP ≥ 160 mmHg and/or diastolic BP ≥ 110 mmHg on 2 separate readings

No → Labetalol 200 mg orally

Yes → Asthmatic

Nifedipine capsule 10 mg orally (not sublingual)

Recheck BP in 30 minutes

Is BP below threshold?

Yes → Labetalol 200 mg orally

Recheck BP in 30 minutes

Is BP below threshold?

Yes → Nifedipine 10 mg orally

Recheck BP in 30 minutes

Is BP below threshold?

Yes → IV labetalol (5 mg/ml) Loading: 10 ml (50 mg) over 2 minutes Repeat every 5 minutes (max. 4 doses) until BP controlled

Maintenance:
Start infusion at 4 ml/hour Double infusion rate every 30 minutes until BP controlled Max. infusion rate 32 ml/hour

No → IV hydralazine (1 mg/ml) Loading: 5 ml (5 mg) over 15 minutes If diastolic > 100 after 20 minutes give further 5 ml over 15 minutes

Maintenance: Start infusion at 5 ml/hour Titrate to diastolic 90–100 Usual rate 2–3 ml/hour Max. infusion rate 18 ml/hour Reduce rate if significant adverse effect or maternal pulse > 120 beats/minute

Aim to keep diastolic BP 90–100 mmHg and systolic BP 140–150 mmHg

Caution: all three drugs have cumulative effect (peak at 30 minutes) and all three interact with magnesium sulphate. Nifedipine also increases the muscular blockade of magnesium sulphate.

Figure 3.4 Treatment guidelines for severe hypertension
Figure 3.5 Fluid balance in the mother with oliguric pre-eclampsia
Fetal monitoring

– Chronic hypertension

• ultrasound fetal growth and amniotic fluid volume assessment and umbilical artery doppler velocimetry between 28 and 30 weeks and between 32 and 34 weeks. If results are normal, do not repeat at more than 34 weeks, unless otherwise clinically indicated.

• In women with mild or moderate gestational hypertension, do not carry out ultrasound fetal growth and amniotic fluid volume assessment and umbilical artery doppler velocimetry if diagnosis is confirmed after 34 weeks, unless otherwise clinically indicated.
Fetal monitoring

• Severe gestational hypertension or pre-eclampsia
• If conservative management of severe gestational hypertension or preeclampsia is planned, carry out all the following tests at diagnosis:
  • ultrasound fetal growth and amniotic fluid volume assessment, umbilical artery doppler velocimetry.
  • Carry out cardiotocography at diagnosis of severe gestational hypertension or pre-eclampsia.
Breastfeeding

• No known adverse effects on babies receiving breast milk:
  • labetalol
  • Nifedipine
  • enalapril
  • captopril
  • atenolol
  • metoprolol
Take home message

Pre-eclampsia = Think of

- **Pulmonary Oedema** → Keep the patient dry
- **Stroke** → keep the BP under 150/100
- **HELLP** → check blood
- **IUGR** → ultrasound for growth and doppler
- **Eclampsia** → be one step ahead and give Mgso4 when indicated, be prepared.
Thank you