MATERNAL MORTALITY

Prof. Dr. YAPRAK ÜSTÜN
Trends in Maternal Mortality: 1990 to 2015


<table>
<thead>
<tr>
<th>Year</th>
<th>Maternal mortality ratio (per 100,000 live births)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>385/100 000</td>
</tr>
<tr>
<td>2015</td>
<td>216/100 000</td>
</tr>
</tbody>
</table>

44% decrease from 1990 to 2015

83.5% decrease in Turkey
Countries with baseline MMR < 420

Countries with baseline MMR > 420

reduction > 2/3
(ARR > 5.5%)
Global causes of maternal death

Causes of maternal death in Turkey by percentage
POSTPARTUM HEMORRHAGE

COMMON ERRORS

- Failure to use a working diagnosis
- Failure to act decisively
- Insufficient replacement of blood & components
- Failure to adequately prepare for placenta accreta
Case 1

- 35 y, 5G, 37 w, bleeding
- **12:20** Labor induction
- **15:50** NVYD (3400 g)
- **16:45** PPH, Medical treatment-Bakri
- **17:00** Hysterectomy-blood tx-ex
Case 1

- 35 y, 5G, 37 w, bleeding
- **12:20** Labor induction
- **15:50** NVYD (3400 g)
- **16:45** PPH, Medical treatment - Bakri
- **17:00** Hysterectomy - Blood tx

**Diagram:**
- Failure to use a working diagnosis
- Every 15 min in the 1st hour
- Every 30 min in the 2nd hour
Case 1

- 35 y, 5G, 37 w, bleeding
- 12:20 Labor induction
- 15:50 NVYD (3400 g)
- 16:45 PPH, Medical treatment - Bakri
- 17:00 Hysterectomy - blood tx - ex

<table>
<thead>
<tr>
<th>Medium Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior cesarean or uterine surgery</td>
<td>Previa, accreta, increta, percreta</td>
</tr>
<tr>
<td>More than four previous deliveries</td>
<td>HCT &lt;30</td>
</tr>
<tr>
<td>Multiple gestation</td>
<td>Bleeding at admission</td>
</tr>
<tr>
<td>Large uterine fibroids</td>
<td>Known coagulation defect</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
<td>History of postpartum hemorrhage</td>
</tr>
<tr>
<td>Magnesium sulfate use</td>
<td>Abnormal vital signs (tachycardia and hypotension)</td>
</tr>
<tr>
<td>Prolonged use of oxytocin</td>
<td></td>
</tr>
</tbody>
</table>
Case 2

• 42y, 6G 5P (previous C/S), Hb:11.0 g/dl
• **09:50** C/S (4500 g)
• **10:30** PPH, 98/min, TA:90/70 mmHg, Hb:9.7, WBC: 24.000, fibrinogen: 136 (Syn + methergine + cytotec)
• **12:50** PPH, Hb:7, fibrinogen:89 (L/T: B-Lynch + BHAL + 3U ERT)
• **15:50** Hemodynamic instability (L/T: Hysterectomy + 5U ERT + 3U FFP)
Case 2

- 42y, 6G 5P (previous C/S), Hb: 11.0 g/dl
- 09:50 C/S (4500 g)
- 10:30 PPH, WBC: 24.000, fibrinogen: 136 (Syn + methergine + cytotec)
- 12:50 PPH, Hb: 7, fibrinogen: 89 (L/T: B-Lynch + BHAL + 3U ERT)
- 15:50 Hemodynamic instability (L/T: Hysterectomy + 5U ERT + 3U FFP)

Visual estimation of postpartum blood loss underestimates blood loss by 33-50% ↓

Fleischer, 2016
Clark, 2016
Gravimetric estimation

Weigh any absorbent material
Sheets
Pads
Sponges

Dry weight

1 g = 1 mL blood

Lilley, 2015
Case 2

- 42y, 6G 5P (previous C/S), Hb: 11.0 g/dl
- 09:50 C/S (4500 g)
- 10:30 PPH, 98/57 mmHg, Hb: 9.7, WBC: 24.000, fibrinogen: 136 (Syn + methergine + cytotec)
- 12:50 PPH, Hb: 7, fibrinogen: 89 (L/T: B-Lynch + BHAL + 3U ERT)
- 15:50 Hemodynamic instability (L/T: Hysterectomy + 5U ERT + 3U FFP)

Diagram:

- Diagnosis of PPH
  - Hemodynamic changes
    - Shock index
      - >1.1
      - 1.1-1.3
      - >1.3

Fleisher, 2016
Clark, 2016
Case 2

- 42y, 6G 5P (previous C/S), Hb:11.0 g/dl
- 09:50 C/S (4500 g)
- 10:30 PPH, Shock index =1.1, BP: 98/60 mmHg, Hb:9.7, WBC: 24.000, fibrinogen: 136 (Syn + methergine + cytotec)
- 12:50 PPH, Hb:7, fibrinogen:89 (L/T: B-Lynch + BHAL + 3U ERT)
- 15:50 Hemodynamic instability (L/T: Hysterectomy + 5U ERT + 3U FFP)
Case 2

• 42y, 6G 5
  P (previous C/S), Hb:11.0 g/dl
• 09:50 C/S (4500 g)
• 10:30 PPH, 98/252 min, TA:90/70 mmHg, Hb:9.7, WBC: 24.000, fibrinogen: 136 (Syn + methergine + cytotec)
• 12:50 PPH, Hb:7, fibrinogen:89 (L/T: B-Lynch + BHAL + 3U ERT)
• 15:50 Hemodynamic instability (L/T: Hysterectomy + 5U ERT + 3U FFP) 4 hours

DIAGNOSIS OF PPH

Laboratory changes

CBC
PT/PTT
Fibrinogen < 200 mg%
Lactic acid >7.5

Fleischer, 2016
Clark, 2016
Case 2

- 42y, 6G 5P (previous C/S), Hb: 11.0 g/dl
- 09:50 C/S (4500 g)
- 10:30 PPH, 98/min, TA: 90/70 mmHg, Hb: 9.7, WBC: 24,000, fibrinogen: 136 (Syn + methergine + cytotec)
  - Early finding < 200
- 12:50 PPH, Hb: 7, fibrinogen: 89 (L/T: B-Lynch + BHAL + 3U ERT)
- 15:50 Hemodynamic instability (L/T: Hysterectomy + 5U ERT + 3U FFP)
  - Early finding

Fibrinogen

- First coagulation parameter to become abN in massive hemorrhage
- 2 g fibrinogen increase serum fibrinogen by 100 mg/dL
Case 2

• 42y, 6G 5P (previous C/S), Hb:11.0 g/dl
• 09:50 C/S (4500 g)
• 10:30 PPH, 98/min, TA:90/70 mmHg, Hb:9.7, WBC: 24.000, fibrinogen: 136 (Syn + methergine + cytotec)
• 12:50 PPH, Hb:7, fibrinogen:89 (BHAL + 3U ERT)
• 15:50 Hemodynamic instability (Hysterectomy + 5U ERT)

Tranexamic Acid

Should be considered in the setting of PPH when initial medical therapy fails.

Should be given within 3 hours of birth

WOMAN trial, Lancet, 2017
Case 2

- 42y, 6G
- Previous C/S, Hb: 11.0 g/dl
- 09:50 C/S (4500 g)
- 10:30 PPH, 98/55 mmHg, Hb: 9.7, WBC: 24.000, fibrinogen: 136 (Syn + methergine + cytotec)
- 12:50 PPH, Hb: 7, fibrinogen: 89 (L/T: B-Lynch + BHAL + 3U ERT)
- 15:50 Hemodynamic instability (L/T: Hysterectomy + 5U ERT + 3U FFP)
MANAGEMENT OF PPH

- Fluid (RL, saline)
  - Fluid/EBL 1:1 or 2:1

- Oxygen
  - 10-12 L/min
  - PaO₂ < 200 mmHg

- Tx
  - FFP
  - Fibrinogen
  - Blood
  - Tranexemic acid

Fleischer, 2016
Clark, 2016
<table>
<thead>
<tr>
<th>TANI</th>
<th>2012 n (%)</th>
<th>2013 n (%)</th>
<th>2014 n (%)</th>
<th>2015 n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kardiyovasküler</td>
<td>42 (21.9%)</td>
<td>54 (24.1%)</td>
<td>44 (20.7%)</td>
<td>40 (21.9%)</td>
</tr>
</tbody>
</table>
CASE

- 16 y, 5 w, dyspnea
- Systolic murmur on aortic focus
- Echo: Pulmonary HT
- 3 times antenatal follow-up
- 35 w, maternal and fetal ex
CASE

- 16 y, 5 w
- Systolic murmur on aortic focus
- Echo: Pulmonary HT
- 35 w, maternal and fetal CARPREG

WHO Class 4

- Pulmonary HT
- Severe ventricular dysfunction, LVEF< %30
- Previous peripartum KMP
- Left heart obstruction
- Marfan syndrome, aortic dilatation > 40 mm
CASE

- 16 y, 5 w,
- Systolic murmur on aortic focus
- Echo: Pulmonary HT
- 35 w, maternal and fetal ex

FOLLOW-UP

Coexisting conditions
- BMI
- ECG, Echo
- Medication

At the start, 32 w ECG, Echo
Pre-delivery anesthesia
Hypertensive disorders of pregnancy

Intracranial hemorrhage is the major final cause of death

Introduce specific checklist based protocols for prompt recognition and treatment of hypertensive crisis
CASE

- 43 y, 1G, BMI: 35 kg/m²
- Antenatal follow-up: N
- 34 w seizure at home
- MgSO₄ – Recurrent seizure
- CT-Intracranial bleeding
- ICU-ex
CASE

• 43 y, 1G, BMI:35 kg/m²
• Antenatal follow-up: N
• 34 w seizure at home
• MgSO₄ – Recurrent seizure
• CT-Intracranial bleeding
• ICU-ex
ACOG - For women with a history of early onset PE and PD or PE >1 pregnancy 60-80 mg/d ASP in late first trimester

NIH recommends high risk women to take 75 mg/d ASP (12w until birth)

Rolnik et al (2017, NEJM) 150 mg/d (11-36 w)
Shallow invasion of trophoblast

↓ placental perfusion

Ischemia

Activation of platelets

Thromboxane ↑

Prostacyclin
Nitric oxide

LOW DOSE ASPIRIN

%17 ↓
ASPIRIN

Positive risk factors

Dose
60-150 mg/d

Duration
12 w-36 w
Pregnancy + Fever

- October-April
- ≥ 38 °C
- Cough, sore throat, malaise, diarrhea, headache

CONSULTATION

Oseltamivir 75 mg 2X1/d
Hospitalization Criteria

- Dispnea or respiratory stress
- Change in vital signs
  - Hypotension (systolic < 90 mmHg)
  - Tachypnea (30/min)
  - Heart rate > 120 /min
- Hypoxia (sPO2 > %92)
- Mental status change
- Pneumonia on graph
Cerebrovascular Events

57 cases of epilepsy (2007-2014)
40 (87%) were sudden and unexpected death (SUDEP)

SUDEP is a significant risk factor for pregnant epileptics
Antiepileptic drug related factors may be relevant

Every attempt should be made to prevent seizures during pregnancy and in the postpartum period
Pulmonary Embolism

- 17 (7.5%) of such maternal deaths in 2016
- 2 were with HEG
- 9 were in postpartum period after C/S (4 emergency CS)

All women should be assessed early in antenatal period and after delivery for risk factors for VTE.

<table>
<thead>
<tr>
<th>RISK FACTORS</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/S in labor</td>
<td>2</td>
</tr>
<tr>
<td>Elective C/S</td>
<td>1</td>
</tr>
<tr>
<td>Hyperemesis</td>
<td>3</td>
</tr>
</tbody>
</table>
GREEN-TOPO GUIDELINE
No. 37a
November 2009

REDUCING THE RISK OF THROMBOSIS AND EMBOLISM DURING PREGNANCY AND THE Puerperium
<table>
<thead>
<tr>
<th>Preexisting risk factors</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous recurrent VTE</td>
<td>3</td>
</tr>
<tr>
<td>Previous VTE-unprovoked/Estrogen related</td>
<td>3</td>
</tr>
<tr>
<td>Previous VTE-provoked</td>
<td>2</td>
</tr>
<tr>
<td>Family history of VTE (1st degree relative)</td>
<td>1</td>
</tr>
<tr>
<td>Known thrombophilia</td>
<td>2</td>
</tr>
<tr>
<td>Medical comorbidities (SLE, OHA, proteinuria&gt;3g)</td>
<td>2</td>
</tr>
<tr>
<td>Age &gt; 35</td>
<td>1</td>
</tr>
<tr>
<td>BMI &gt;40 kg/m2</td>
<td>2</td>
</tr>
<tr>
<td>Parity &gt;3</td>
<td>1</td>
</tr>
<tr>
<td>Gross varicose veins</td>
<td>1</td>
</tr>
</tbody>
</table>
## Obstetric risk factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe preeclampsia</td>
<td>1</td>
</tr>
<tr>
<td>Dehydration,</td>
<td>1</td>
</tr>
<tr>
<td>Multiple pregnancy</td>
<td>1</td>
</tr>
<tr>
<td>Emergency C/S</td>
<td>2</td>
</tr>
<tr>
<td>Elective C/S</td>
<td>1</td>
</tr>
<tr>
<td>Forceps application</td>
<td>1</td>
</tr>
<tr>
<td>Prologed labor &gt; 24 h</td>
<td>1</td>
</tr>
<tr>
<td>PPH &gt; 1L or transfusion</td>
<td>1</td>
</tr>
</tbody>
</table>
• Clinical rather than asymp. VTE should be used for estimates of VTE incidence

• LMWH reduces VTE by %70.

• NNT: 4000 (1 VTE event) :360000 (1 PE event)

• For each VTE avoided: 2 major hemorrhage, 7 wound hematoma, 6 tx
CASE

41y, G:4 P:3 A:1 Y:3, previous C/S, varice +, 91 kg
345 w + labor-- C/S
Postop 2.day discharged
Postop 5.day-incision infection-hospitalization
Postop 7.day suturization
Postop 8.day discharged
Postop 10.day acute dyspnea, chest pain
Pulmonary artery angio: middle lobar artery thrombus-arrest-ex
CASE

<table>
<thead>
<tr>
<th>Postpartum infection$^{16,32}$</th>
<th>4.1$^{32}$</th>
<th>2.9–5.7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.1$^{16}$</td>
<td>5.0–7.5</td>
</tr>
<tr>
<td></td>
<td>4.1$^{16}$</td>
<td>3.0–5.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Postpartum infection + caesarean section$^{12}$</th>
<th>6.2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.4–16.2</td>
</tr>
</tbody>
</table>

Postop 2. day

Postop 5. day

Postop 7. day

Postop 8. day

Postop 10. day

Pulmonary artery angio:
- middle lobar artery thrombus
- arrest-ex

Infection

- Immobilisation
- Thromboinflammatory pathway activation
- Venous stasis
- DIC
• All women should be assessed after delivery for risk factors for VTE.

• Women with ≥ 2 risk factors should receive LMWH for 10 d.
Dergimiz JTGGGA artık Pubmed Central’de...