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مراقبت های ویژه در بیماری های زنان و ماماپی

نسیم بهرامی
عضو هیات علمی دانشکده پرستاری و ماماپی

دکتر نسیم بهرامی
Every Mom’s Dream......
The 99 obstetric admissions to ICU were represented by 0.2% of all deliveries and 1.6% of all ICU admissions.

Most patients were young (median age of 30 years) with parity (median) of 3 and stayed in ICU for an average of 2 days. All except one patient were admitted during the postpartum period. The majority (76%) were admitted after cesarean section.

Obstetric hemorrhage (32%) and hypertension (29%) were the 2 most common indications for admission. The majority (59/99) of patients also had pre-existing medical problem and most common (16/59) was rheumatic heart disease.

Preeclampsia (23/99) and eclampsia 10/99 were the most frequent obstetric complication. Thirty-six percent of our patients required ventilatory support. In the majority of patients, direct arterial (81%) and central venous (73%) pressure monitoring was carried out. Pulmonary arterial and left atrial pressure was monitored in 4%.

Almost one third of patients received antihypertensive therapy. Inotropic support was given to 9% and blood (and its products) was given to 46% of patients. Antibiotics (28%) and magnesium sulphate (25%) were the most frequently used medicines.

Out of the total 99 admissions, one patient died and 16 patients developed complications.
A total of 43 women required admission to the intensive care unit (ICU), which represented 0.37% of all deliveries.

The majority (95.3%) of patients were admitted to the ICU postpartum. The most common reasons for admissions were (pre) eclampsia (48.8%) and obstetric haemorrhage (37.2). The remainder included adult respiratory distress syndrome (6.9%), pulmonary embolism (2.3%) and neurological disorders (4.6%).

Mechanical ventilation was required to support 18.6% of patients and transfusion of red blood cells was needed for 48.8% of patients.

There were three maternal deaths (6.9%).

A multidisciplinary team approach is essential to improve the management of hypertensive disorders and postpartum haemorrhage to achieve significant improvements in maternal outcome.
Introduction...

- The commonest indication for Intensive Care Unit (ICU) admission of obstetric patients is hemorrhage, both ante-partum and post-partum.

- Hypertensive disorders, pre-eclampsia, and its related complications are also major contributory factors for such admissions.

- These reflect the lack of proper antenatal care and timely management of obstetrical emergencies, especially in the developing countries.

- The obstetrician's involvement is of prime importance when managing such cases in the ICU.
Challenges...

• Economic factors, socio-cultural characteristics, and different hospital protocols and management policies, further widen the gap of bringing uniform admission criteria

• One of the most striking similarities in all such patients is their young age, which in fact is a good prognostic indicator, provided they receive timely interventions for their acute pathologies
Indications for ICU admission

• Conditions related to pregnancy – eclampsia, severe pre-eclampsia, hemorrhage, amniotic fluid embolism, acute fatty liver, peri-partum cardiomyopathy, aspiration syndromes, infections etc.

• Medical diseases that may be aggravated during pregnancy - congenital heart diseases, rheumatic and non-rheumatic valvular diseases, pulmonary hypertension, anemia, renal failure etc.

• Conditions that are not related to pregnancy – trauma, asthma, diabetes, autoimmune diseases etc.
MONITORING DURING CRITICAL ILLNESS

- Invasive monitoring is essential in most critically ill patients both during surgical procedures and during the ICU stay.
- Central venous pressure monitoring is used to guide fluid administration.
- The pulmonary artery catheter is extremely useful for measuring central venous pressure (CVP), pulmonary capillary wedge pressure (PCWP), systemic vascular resistance (SVR), cardiac output (CO), pulmonary artery (PA) pressure, and mixed venous oxygen saturation (SvO₂).
Staff pattern to help the skilled and experienced obstetrician IN ICU
Relevance of OB physiology

• 5-10% of women are pregnant
  • Many don’t know or show

• Any female of reproductive age could be pregnant
  • Should be assumed so!

• Virtually every organ system affected

• Can touch almost any specialty
CASE HISTORY
Case 1

• 36 y.o. female presents to ER
• CC: Fatigue, dyspnea, chest pain
• HPI:
  • Progressive dyspnea over several weeks.
  • Poor exercise tolerance and easy fatigability
    • ‘get winded after 1 flight of stairs’
  • Substernal chest pain, peaks in morning and night
  • Nocturnal cough, semi-productive – clear
  • Leg swelling
  • Polyuria
Case 1

• PMH
  • Mild obesity

• Ob/gyn – menses at age 12; irregular menses; no pregnancies

• Meds
  • Oral contraceptives
  • Multivitamins

• Social
  • Married for 2 years. No exposures
Case 1: PE

• Skin
  • warm, clammy. Mild facial acne and increased hair – medium coarseness

• HEENT
  • Nasal mucosa slightly hyperemic.
  • Mild non-nodular thyromegaly

• CV
  • Tachycardia (HR 107)
  • + JVD
  • systolic murmurs over pulmonic and aortic v.
PE cont’d

• Chest
  • Clear bilaterally. Diaphragm elevated
  • 1+ pretibial pitting edema

• Abd
  • Skin – spider angiomata and striae. Medium course hair, infraumbilical.
  • Distended, firm, non-tender.
Studies / labs

- **EKG:**
  - Sinus rhythm; tachy; Left axis deviation

- **CXR:**
  - Lungs clear. Cardiomegaly.

- **Labs:**
  - Hct 32% (low); WBC 12 (high)
  - Cholesterol 300 mg/dl
  - D-dimer elevated
  - Potassium and creatinine low
WHAT DOES SHE HAVE???
General Principles

• Most changes begin early
  • Even before pregnancy recognized

• Most are hormonally driven
  • Progesterone, estrogen, renin / aldosterone, cortisol, insulin
  • Some ‘mechanically’ driven

• Designed to optimize conditions for fetus & prepare for delivery
  • Delivery of oxygen & nutrients
PHYSIOLOGICAL CHANGES IN PREGNANCY

- Plasma Volume
- Heart Rate & Stroke Volume
- Cardiac Output
- BP
- Clinical Findings
- ECG
PLASMA VOLUME

- **Pl. volume** start ↑ by 6 wks
- 50% ↑ 2nd trimester then plateaus till delivery
- **Red cell mass** ↑ to lesser extent
Figure 3–11. Blood volume changes during pregnancy. (From Scott D: Anemia during pregnancy. Obstet Gynecol Ann 1:219, 1972.)
Cardiovascular & Hematologic

• Vascular
  • Decreased tone / vaso-relaxation
    • SVR decreased 20%
  • Positional effects
  • Placenta – low resistance shunt

• Hematologic
  • Blood volume increases 50-100%
  • RBC increases 25-40%
    • Relative anemia ("physiologic")
Heart rate & Stroke Volume

Heart rate
- ↑ 10 – 20 %
- remains high 2–5 d after delivery

SV
- ↑ from 8 wks
- Peak at 20 wks
- ↓ to baseline by 2 wks PP
CARDIAC OUTPUT

- CO begins to ↑ in 1st trimester
- By end of 2nd trimester 30-50% above baseline.
- In early pregnancy ↑ CO is primarily by ↑ in SV
- In late pregnancy : HR is the major factor
CO Variation with position

Cardiac output (L/min)

Weeks of gestation

Nonpregnant

10

20

30

40

Left lateral

Supine
CARDIAC OUTPUT

- Beginning of labor: > 7 L/min
- Uterine contraction: > 9 L/Min
- Anesthesia: < 8 L/min

- CO falls to non-pregnant values within a few weeks after delivery

- CO ↑ in twins or triplets is only slightly greater than in single pregnancy
BP

- BP falls in early gestation & DBP ↓ 10 mm below baseline in the 2nd trimester

- Vasodilatation by prostacyclin & NO

- In 3rd trimester DBP ↑ to non-pregnant values by term
Blood Pressure

![Graph showing blood pressure levels over weeks]

Blood pressure readings:
- Normal levels:
  - 50 to 60 mmHg
  - 65 to 70 mmHg
  - 75 mmHg

Weeks:
- 8 to 16
- 20 to 25
- 28 to 35
- 36 to 40

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BP & SVR

CO = \frac{\text{BP}}{\text{SVR}}

BP (mm Hg)

SVR (dyn × s × cm⁻²)

Nonpregnant 10

20

30

40

700

900

1100

1300

1500
## Pregnancy Adaptations

<table>
<thead>
<tr>
<th>Factor</th>
<th>Preg.</th>
<th>NonPrg</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>6.2</td>
<td>4.3</td>
<td>+43%</td>
</tr>
<tr>
<td>MAP</td>
<td>86</td>
<td>90</td>
<td>-10%</td>
</tr>
<tr>
<td>SVR</td>
<td>1210</td>
<td>1530</td>
<td>-21%</td>
</tr>
<tr>
<td>PVR</td>
<td>78</td>
<td>119</td>
<td>-34%</td>
</tr>
<tr>
<td>HR</td>
<td>83</td>
<td>71</td>
<td>+17%</td>
</tr>
</tbody>
</table>
Mechanisms for Hemodynamic Changes

• Total body water ↑ by 6 to 8 L

• Sodium retention

• Increased arterial compliance

• Increased venous capacitance
Clinical Findings in Normal Pregnancy

- Elevated JVP [↑plasma vol]
- Apex slightly left & up, prominent impulse
- Tachycardia
  - low DBP
  - PP ↑ [bounding pulses]
- Pedal oedema: ↑ plasma vol & venous pressures
Changes

• Cardiac axis displaced cephalad and left
  • PMI lateral & elevated (not just due to baby!)
    • Altered thoracic dimensions
  • Left axis deviation

• Murmurs > 96%
  • Virtually all valves
    • Esp. Aortic and Pulmonary

• Rate – increased

• Ventricular distention – 25% increase
ECG

• Tachycardia

• LAD : elev. Diaphragm

• Increased ventricular voltage
Hematologic

• Hypercoagulable
  • Estrogen & Vascular stasis
  • Increased risk for thromboembolic disease
    • Increase in fibrinogen, all coag factors except II, V, XII
    • Fall in protein S and sensitivity to APC
  • Fall in platelets and factor XI and XIII
• Increase in WBC
Hematologic changes at term:

- Fibrinogen increased.
- PT, PTT shortened 20%.
- Increased platelet turnover.

- Increase in coagulation factors,
- immobilization and aorto-caval compression all increase risk of DVT.
ANATOMICAL CONSIDERATIONS
Uterine Position over Time
NORMAL PHYSIOLOGY OR DISEASE?
Signs & Symptoms of Normal Pregnancy that may Mimic Heart Disease

**Signs**
- Peripheral edema
- JVD

**Symptoms**
- Reduced exercise tolerance
- Dyspnea

**Auscultation**
- S3 gallop
- Systolic ejection murmur

**Chest x-ray**
- Change in heart position & size

**EKG**
- Nonspecific ST-T wave changes
- Axis deviation
OTHER SYSTEMS
Changes in the Filter

• Renin – stimulated by progesterone
  • Also made by placenta
  • Angiotensinogen → Angiotensin I → Angiotensin II → Aldosterone → Distal tubule

  • Net absorption of Na⁺
  • Excretion of K⁺
  • Water retention: 6-8 liters

• Increased renal blood flow
  • 50-75% increase
  • GFR – 50% increase
  • Decreased Albumin = lower colloid oncotic pressure
Other urinary tract changes

- Ureteral dilation / hydroureter
  - Smooth muscle relaxation
  - Later exacerbation by uterine obstruction
  - Urinary stasis*
- Dilation of pelves and calyces
- Increased kidney size
LUNGS AND RESPIRATION
Respiratory Adaptations

- **No** change in rate or IRV
- **Thorax**
  - Tr. Diameter 2cm; circumference 5-7cm
- **Increased minute ventilation**
- **Reduced FRC** – 20%
- **Increased Tidal Volume** – 30-40%
- **Compensated respiratory alkalosis**
  - pH 7.4+
  - $\uparrow$PaO$_2$; $\downarrow$PaCO$_2$ (40 – 30)
At term, mother has respiratory alkalosis with metabolic compensation

<table>
<thead>
<tr>
<th>ABGs</th>
<th>Non-pregnant</th>
<th>At term</th>
</tr>
</thead>
<tbody>
<tr>
<td>PaCO2</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>PaO2</td>
<td>100</td>
<td>103</td>
</tr>
<tr>
<td>pH</td>
<td>7.40</td>
<td>7.44</td>
</tr>
<tr>
<td>HCO3-</td>
<td>24</td>
<td>18</td>
</tr>
</tbody>
</table>
Respiratory Changes

Figure 3–10. Lung volumes in nonpregnant and pregnant women. TLC, total lung capacity; VC, vital capacity; IC, inspiratory capacity; FRC, functional residual capacity; IRV, inspiratory reserve volume; TV, tidal volume; ERV, expiratory reserve volume; RV, residual volume. (From Cruickshank DP, Wigton TR, Hays PM: Maternal physiology in pregnancy. In Gabbe SG, Niebyl JR, Simpson JL [eds] Obstetrics: Normal and Problem Pregnancies, 3rd ed. New York, Churchill Livingstone, 1996, p 94, with permission.)
Gastrointestinal

- Slowed GI motility
  - Constipation, early satiety

- Relaxation of LES
  - GERD

- Nausea / vomiting
  - Often proportional to HCG level

- Liver / gallbladder
  - Biliary stasis, cholesterol saturation
    - More stones
  - Coagulation factors
  - Increased binding proteins (thyroid, steroid, vitamin D)
Other “Adaptations”

• “I can’t see my feet!!!”
  • Altered center of gravity
  • Altered gait
  • Greater joint laxity
    • Widening of symphysis pubis
    • Affects other joints
    • Thorax; widened costovertebral angle
• Fatigue / somnolence
Other Changes

- Spider angiomata and palmar erythema
- Hair growth (abdomen and face)
- Mucosal hyperemia
- Striae gravidarum
- Hyperpigmentation (esp. linea nigra)
  - Rashes and acne relatively common
Other Endocrine

• Pancreas
  • Carbohydrate metabolism - Insulin resistance
    • Human placental lactogen, cortisol

• Thyroid Function
  • Increased TIBG (via liver)
  • Increased total $T_4$ and $T_3$
    • free levels unchanged
    • HCG suppresses TSH

• Adrenal function
  • Free plasma cortisol is elevated
    • CRH from placenta stimulates ACTH
Pregnancy – not a disease

• Profound changes in physiology and anatomy

• Affects most organ systems

• Can dramatically impact disease states, susceptibility, and treatment

• Almost all will encounter and treat pregnant women
  • Even if you don’t know it

• Under-appreciation of changes will lead to suboptimal treatment or outright mistakes
<table>
<thead>
<tr>
<th>Disease State</th>
<th>Initial Signs and Symptoms</th>
<th>Later Signs and Symptoms</th>
<th>Laboratory Abnormalities</th>
<th>Maternal Complications and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute fatty liver of pregnancy</td>
<td>Malaise, epigastric pain, nausea, vomiting, jaundice</td>
<td>Encephalopathy, renal failure, DIC, hypoglycemia</td>
<td>Elevated white blood cell count; elevated ALT, AST, and bilirubin; normal LDH; low platelet count</td>
<td>Pancreatitis, diabetes insipidus, fulminant hepatic failure, sepsis; may also have HELLP syndrome</td>
</tr>
<tr>
<td>Severe preeclampsia</td>
<td>Headache, right upper quadrant pain, edema, hypertension</td>
<td>Hypertensive emergency, pulmonary edema</td>
<td>Mildly elevated ALT, proteinuria</td>
<td>Eclampsia, acute renal failure, hepatic capsular rupture</td>
</tr>
<tr>
<td>HELLP syndrome</td>
<td>Right upper quadrant pain, nausea, vomiting, malaise, headaches, visual changes</td>
<td>Hematuria, petechiae, ecchymosis</td>
<td>Low platelet count, elevated bilirubin, elevated AST, ALT, LDH</td>
<td>DIC, acute renal failure, hepatic hemorrhage or failure, ARDS, sepsis, cerebrovascular accident</td>
</tr>
<tr>
<td>Viral hepatitis</td>
<td>Nausea, vomiting, fever, jaundice</td>
<td>Encephalopathy, sepsis, coagulopathy, hypoglycemia</td>
<td>Very elevated transaminases, elevated bilirubin, positive serology</td>
<td>Fulminant hepatic failure, hepatic coma, sepsis, GI bleeding</td>
</tr>
<tr>
<td>TTP</td>
<td>Mild fever, nausea, vomiting, abdominal pain, petechiae</td>
<td>CNS effects - headache, visual changes, confusion, seizures; other organ involvement</td>
<td>Very low platelet count and hematocrit, very elevated LDH and bilirubin, mildly elevated ALT, AST</td>
<td>Diffuse subcortical microvascular disease, acute renal failure; could cause placental thrombosis</td>
</tr>
<tr>
<td>Antiphospholipid antibody syndrome</td>
<td>Thrombosis</td>
<td>Thrombotic renal disease, GI ischemia</td>
<td>Low hematocrit and platelet count, presence of LA, aCL, or β₂-GP-1</td>
<td>Multiorgan failure leading to &quot;catastrophic antiphospholipid syndrome,&quot; development of TTP</td>
</tr>
</tbody>
</table>

*aCL = antiphospholipid antibodies; ALT = alanine aminotransferase; ARDS = adult respiratory distress syndrome; AST = aspartate aminotransferase; β₂-GP-1 = β₂-glycoprotein-I antibodies; CNS = central nervous system; DIC = disseminated intravascular coagulation; GI = gastrointestinal; HELLP = hemolysis, elevated liver enzymes, and low platelet count; LA = lupus anticoagulant; LDH = lactate dehydrogenase; TTP = thrombotic thrombocytopenic purpura.