Infections in Pregnancy

Sudha Jasmine Rajan

Medicine 3
Outline

- Implications of infections on maternal and fetal outcome
- Spectrum of infections in pregnancy and why?
- Recognizing sepsis in pregnancy
- Management of specific acute fevers in pregnancy
"You can tell the condition of a Nation by looking at the status of its women." Jawahar Lal Nehru

- 1.34 Billion population
- ≈ 26 million births/ year
- Mean age at birth of 1st child: 19.9 years
- Median age at first birth among women 25-29 (2005/06 est.)
- MMR 174 deaths/100,000 live births (2015 est.)
- ≈ 45335 deaths of young mothers / year
- children are 10 times more likely to die within two years of their mothers’ death
Maternal mortality data

- January 2003 and December 2012
- 98,139 deliveries
- 212 maternal deaths
- Mean age: $23.98 \pm 4.15$ y
- $1/3^{rd}$: infections
- 1:1 pregnancy related infection Vs Pregnancy unrelated infection


Changing perspectives of infectious causes of maternal mortality. Halder A¹, Vijayselvi R², Jose R².
<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pregnancy-related infection</strong></td>
<td></td>
</tr>
<tr>
<td>Metritis with pelvic cellulitis</td>
<td>25 (11.79%)</td>
</tr>
<tr>
<td>Necrotizing fasciitis</td>
<td>1 (0.47%)</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
<td>1 (0.47%)</td>
</tr>
<tr>
<td>Septic abortion</td>
<td>7 (3.3%)</td>
</tr>
<tr>
<td><strong>Pregnancy-unrelated/Incidental infection</strong></td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>10 (4.7%)</td>
</tr>
<tr>
<td>H1N1 influenza</td>
<td>6 (2.8%)</td>
</tr>
<tr>
<td>Scrub typhus</td>
<td>6 (2.8%)</td>
</tr>
<tr>
<td>Malaria</td>
<td>6 (2.8%)</td>
</tr>
<tr>
<td>Dengue hemorrhagic fever</td>
<td>3 (1.40%)</td>
</tr>
<tr>
<td>Typhoid</td>
<td>1 (0.47%)</td>
</tr>
<tr>
<td>Herpes zoster</td>
<td>1 (0.47%)</td>
</tr>
<tr>
<td>HIV with Pneumocystis carinii pneumonia</td>
<td>1 (0.47%)</td>
</tr>
<tr>
<td>Orbital cellulitis</td>
<td>1 (0.47%)</td>
</tr>
<tr>
<td><strong>Hospital-acquired infection</strong></td>
<td></td>
</tr>
<tr>
<td>Ventilator-acquired pneumonia</td>
<td>15 (7.07%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>84 (39.62%)</td>
</tr>
</tbody>
</table>
### Effect of maternal fever on fetal outcome:

Forest plot of case-control studies considering maternal fever and risk of neural tube defects in the offspring.

<table>
<thead>
<tr>
<th>Study</th>
<th>OR (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yin et al, 2011 (28)</td>
<td>4.94 (3.08–7.93)</td>
<td>11.0</td>
</tr>
<tr>
<td>Li et al, 2007 (30)</td>
<td>4.46 (3.06–6.50)</td>
<td>12.6</td>
</tr>
<tr>
<td>Medveczky et al, 2004 (37)</td>
<td>3.15 (2.30–4.31)</td>
<td>13.6</td>
</tr>
<tr>
<td>Suarez et al, 2004 (42)</td>
<td>2.92 (1.59–5.35)</td>
<td>9.0</td>
</tr>
<tr>
<td>Shaw et al, 2002 (44)</td>
<td>2.31 (1.45–3.68)</td>
<td>11.1</td>
</tr>
<tr>
<td>Shaw et al, 1998 (46)</td>
<td>1.91 (1.34–2.72)</td>
<td>13.0</td>
</tr>
<tr>
<td>Lynberg et al, 1994 (47)</td>
<td>1.68 (1.19–2.37)</td>
<td>13.1</td>
</tr>
<tr>
<td>Zhang and Cai, 1993 (50)</td>
<td>2.93 (1.59–5.43)</td>
<td>8.9</td>
</tr>
<tr>
<td>Kurppa et al, 1991 (31)</td>
<td>3.98 (1.95–8.12)</td>
<td>7.7</td>
</tr>
<tr>
<td>Overall (95% CI)</td>
<td>2.90 (2.22–3.79)</td>
<td></td>
</tr>
</tbody>
</table>

Neural tube defect
Effect of maternal fever on fetal outcome:

Forest plot of case-control studies considering maternal fever and risk of heart defects in the offspring.

- Oster et al, 2011 (39) OR = 1.12 (0.88–1.43) % Weight = 30.2
- Cleves et al, 2008 (41) OR = 1.59 (0.96–2.65) % Weight = 5.9
- Acs et al, 2005 (35) OR = 1.69 (1.37–2.08) % Weight = 27.6
- Shaw et al, 2002 (44) OR = 1.71 (1.01–2.91) % Weight = 4.9
- Botto et al, 2001 (45) OR = 1.84 (1.41–2.39) % Weight = 18.5
- Zhang and Cai, 1993 (50) OR = 1.44 (0.71–2.90) % Weight = 2.9
- Tikkanen and Heinonen, 1991 (32) OR = 1.75 (1.21–2.55) % Weight = 10.0

Overall (95% CI) OR = 1.54 (1.37–1.74) % Weight = 0.0

Fetal heart defects
Effect of maternal fever on fetal outcome:
Forest plot of case-control studies considering maternal fever and risk of oral clefts in the offspring.

- Hashmi et al, 2010 (40): OR 1.24 (1.02–1.51)
- Wang et al, 2009 (29): OR 2.37 (1.78–3.17)
- Acs et al, 2005 (35): OR 2.65 (2.06–3.41)
- Shaw et al, 2002 (44): OR 1.43 (0.95–2.17)
- Erickson, 1991 (48): OR 2.51 (1.66–3.81)
- Overall (95% CI): OR 1.94 (1.35–2.79)

Oral clefts

Julie Werenberg Dreier et al. Pediatrics 2014;133:e674-e688
©2014 by American Academy of Pediatrics
Effect of intrapartum fever on fetal outcome:

- Intrapartum fever was a strong predictor of infection-related death
  - Early neonatal death (OR 1.29, 95% CI 1.01, 1.64)

- Intrapartum fever is an important predictor of neonatal morbidity and infection-related mortality.
  - Meconium aspiration syndrome
  - Hyaline membrane disease
  - Neonatal seizures
  - Assisted ventilation.


Association of maternal fever during labor with neonatal and infant morbidity and mortality.

Petrova A¹, Demissie K, Rhoads GG, Smulian JC, Marcella S, Ananth CV.
Acute Febrile illnesses in pregnancy July 2014-Feb 2015

- UTI: 30%
- Wound infection: 10%
- Post op sepsis: 4%
- TB: 2%
- Scrub typhus: 5%
- Dengue: 7%
- Viral fever: 19%
- H1N1: 4%
- Gastroenteritis: 5%
- URI: 2%
- Skin and soft tissue: 4%
- Pneumonia: 5%
- Others: 3%

Acknowledgement: Sheba Thomas
<table>
<thead>
<tr>
<th>Spectrum of infections in the obstetric patient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pregnancy associated related surgical procedures</strong></td>
</tr>
<tr>
<td>Unrelated to pregnancy ↑ frequency in pregnancy</td>
</tr>
<tr>
<td>Incidental infections during pregnancy</td>
</tr>
<tr>
<td>Hospital-acquired infections</td>
</tr>
<tr>
<td>Infection of LSCS wound</td>
</tr>
<tr>
<td>Episiotomy infection</td>
</tr>
<tr>
<td>Mastitis</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
</tr>
<tr>
<td>Postpartum endometritis</td>
</tr>
<tr>
<td>Septic abortion</td>
</tr>
<tr>
<td>Septic thrombophlebitis</td>
</tr>
<tr>
<td>Puerperal sepsis</td>
</tr>
<tr>
<td>Necrotizing fasciitis</td>
</tr>
<tr>
<td>Pelvic abscess</td>
</tr>
<tr>
<td>Infected cerclage</td>
</tr>
<tr>
<td>Amniocentesis</td>
</tr>
<tr>
<td>Lower UTI</td>
</tr>
<tr>
<td>Pyelonephritis</td>
</tr>
<tr>
<td>Community-acquired pneumonia</td>
</tr>
<tr>
<td>Vector borne:</td>
</tr>
<tr>
<td>Scrub typhus</td>
</tr>
<tr>
<td>Dengue</td>
</tr>
<tr>
<td>Gastrointestinal infections</td>
</tr>
<tr>
<td>HIV-related infections</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
</tr>
<tr>
<td>Cytomegalovirus</td>
</tr>
<tr>
<td>Catheter-related UTI</td>
</tr>
<tr>
<td>Thrombophlebitis</td>
</tr>
<tr>
<td>Wound infection</td>
</tr>
<tr>
<td>Pneumonia nosocomial</td>
</tr>
<tr>
<td>Ventilator-associated pneumonia</td>
</tr>
<tr>
<td>Central line-associated infection</td>
</tr>
</tbody>
</table>

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Immunity during pregnancy

- Cytokines
- Complement cascade
- NK cells
- Macrophages
- PRRs
- Extracellular antigens, bacteria, virus
- Intracellular antigens, cells infected with viruses, rickettsia, mycoplasma

Acquired immunity

Pathogen/antigen

Immediate effect

- B cell
- TH2
- Soluble antigen, activated B cell

Result

Humoral immunity

- CTL
- TH1
- Cell killing by CTLs
- Cell mediated immunity

Medicine CME 2016
# Changes in pregnancy

<table>
<thead>
<tr>
<th>System</th>
<th>changes</th>
<th>impact</th>
</tr>
</thead>
</table>
| **Cardiovascular** | ↓ peripheral vascular resistance  
↑ heart rate  
↓ arterial pressure  
↑ cardiac output | Masking of initial signs of sepsis  
Increased hypoperfusion |
| **Blood** | ↑ plasma volume  
↑ red cell volume  
Anemia | Greater reduction of oxygen supply to tissues |
| **Respiratory** | ↑ tidal volume  
↓ residual volume  
↑ minute-ventilation by 30-40%  
↑ respiratory center simulation → ↑ respiratory rate  
↓ da PaCO | Delayed physiological response to metabolic alkalosis  
Impaired oxygenation |
| **Renal** | Ureteropelvic dilation and ↓ ureteral pressure due to smooth muscle relaxation  
Flaccid bladder ↑ intravesical pressure due to the pregnant uterus weight  
↑ vesicoureteral reflux  
↑ renal plasma flow  
↑ glomerular filtration rate  
↓ urea and creatinine average values  
Asymptomatic bacteriuria | Delayed identification of renal injury secondary to sepsis  
Favorable to pyelonephritis |
| **Coagulation** | ↑ factors VII, VIII, IX, X, XII, Von Willebrand and fibrinogen  
↓ protein S  
↓ fibrinolytic activity | ↑ risk of thrombotic events  
↑ risk of DIC |
| **Genital** | ↓ vaginal pH  
↑ glycogen in vaginal epithelium | ↑ risk of chorioamnionitis |
The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

- Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.
  - Organ dysfunction is defined as an acute change in SOFA score of $\geq 2$ points, consequent to infection.
    - Baseline SOFA score is assumed to be zero in patients not known to have preexisting organ dysfunction.
    - SOFA score of $\geq 2$ reflects overall mortality risk $\sim 10\%$ in general adult population with infection. Even modest dysfunction at presentation can deteriorate.
  - Patients with suspected infection who are likely to have significant morbidity (prolonged ICU stay or in-hospital death) can be identified at the bedside with quick SOFA (qSOFA), if any 2 are present:
    - Alteration in mental status
    - Systolic BP less than or equal to 100 mm Hg
    - Respiratory rate greater than 22/min

- Septic shock is a subset of sepsis in which underlying circulatory/cellular/metabolic abnormalities are profound enough to substantially increase mortality ($>40\%$).

- Patients with septic shock can be identified by:
  - Sepsis with persisting hypotension, requiring vasopressors to maintain mean arterial pressure of $>65$ mm Hg, and
  - Serum lactate level of greater than 2 mmol/L (18 mg/dL) despite adequate fluid resuscitation
Caveats with pregnant women

- Pregnant women are young: Reach the limits of physiological compensation before they collapse:
  - Count heart rate and respiratory rate

- **Normals** are different:

  - Fever may not always be present and are not necessarily related to the severity of sepsis
  - BP: Measure lactates, U/O, Fetal heart rate
  - Gravid uterus: ventilation, CVP
  - Tests: urine RE, SPC cultures: postpartum
  - Antibiotics: greater distribution volume, altered absorption, excretion and reduced drug levels
Sepsis in obstetric score

<table>
<thead>
<tr>
<th>Variable</th>
<th>Normal</th>
<th>+4</th>
<th>+3</th>
<th>+2</th>
<th>+1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
<th>+4</th>
<th>+4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td></td>
<td>+4</td>
<td>+3</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
<td>+1</td>
<td>+2</td>
<td>+4</td>
<td>+4</td>
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<tr>
<td>Temperature (°C)</td>
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<tr>
<td>&gt;40.9</td>
<td></td>
<td>39–40.9</td>
<td></td>
<td>38.5–38.9</td>
<td>36–38.4</td>
<td>34–35.9</td>
<td>32–33.9</td>
<td>30–31.9</td>
<td>&lt;30</td>
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<tr>
<td>Systolic BP (mm Hg)</td>
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<td></td>
<td></td>
<td>&lt;70</td>
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<tr>
<td>&gt;179</td>
<td></td>
<td>150–179</td>
<td>130–149</td>
<td>120–129</td>
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</tr>
<tr>
<td>Heart rate (bpm)</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>&gt;49</td>
<td></td>
<td>35–49</td>
<td></td>
<td>25–34</td>
<td>12–24</td>
<td>10–11</td>
<td>6–9</td>
<td></td>
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<tr>
<td>Respiratory rate/min</td>
<td></td>
<td></td>
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<tr>
<td>$S_{pO_2}$</td>
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<tr>
<td>&gt;39.9</td>
<td></td>
<td>25–39.9</td>
<td>17–24.9</td>
<td>5.7–16.9</td>
<td>3–5.6</td>
<td>1–2.9</td>
<td></td>
<td></td>
<td>&lt;1</td>
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<tr>
<td>WBC (/μL)</td>
<td></td>
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<tr>
<td>% Immature neutrophils</td>
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<tr>
<td>Lactic acid (mmol/L)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>&lt;4</td>
</tr>
</tbody>
</table>

$\geq6$: 16.7% admitted into ICU
$<6$: 0.1% admitted into ICU

Overall goals

- Treat the mother! Resuscitating the mother will resuscitate the fetus
- Delivery attempts increase maternal and fetal mortality assuming the source is not intrauterine
- Improve functional intravascular volume
- Establish and maintain an adequate airway
- Determine the septic foci
- Empiric antibiotic therapy: know the most common pathogens
Tasks <6hrs of the identification of severe sepsis

- Complete History and Clinical examination
- Obtain blood cultures prior to antibiotic administration
- Administer broad-spectrum antibiotic within one hour of recognition of severe sepsis
- Measure serum lactate
- If hypotension ± a serum lactate >4mmol/l: fetal heart rate, urine output (0.5ml/kg/hr)
  - start initial minimum 20ml/kg of crystalloid or an equivalent 1st hour.
- Apply vasopressors for hypotension that is not responding to initial fluid resuscitation
  - to maintain mean arterial pressure (MAP) >65mmHg
# Need for ICU transfers

<table>
<thead>
<tr>
<th>Category</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>Hypotension or raised serum lactate persisting despite fluid resuscitation, suggesting the need for inotrope support</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Pulmonary oedema</td>
</tr>
<tr>
<td></td>
<td>Mechanical ventilation</td>
</tr>
<tr>
<td></td>
<td>Airway protection</td>
</tr>
<tr>
<td>Renal</td>
<td>Renal dialysis</td>
</tr>
<tr>
<td>Neurological</td>
<td>Significantly decreased conscious level</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Multi-organ failure</td>
</tr>
<tr>
<td></td>
<td>Uncorrected acidosis</td>
</tr>
<tr>
<td></td>
<td>Hypothermia</td>
</tr>
</tbody>
</table>

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Risk factors for maternal sepsis by confidential enquiry

- Obesity
- Impaired glucose tolerance / Diabetes
- Impaired immunity/ immunosuppressant medication
- Anaemia
- Vaginal discharge
- History of pelvic infection
- History of group B streptococcal infection
- Amniocentesis and other invasive procedures
- Cervical cerclage
- Prolonged spontaneous rupture of membranes
- GAS infection in close contacts / family members
- Of black or other minority ethnic group origin

<table>
<thead>
<tr>
<th>Gram-negative</th>
<th>Gram-negative</th>
<th>Gram-negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli</td>
<td>Hemophilus influenzae</td>
<td>Klebsiella species</td>
</tr>
<tr>
<td>Enterobacter species</td>
<td>Proteus species</td>
<td>Pseudomonas species</td>
</tr>
<tr>
<td>Serratia species</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gram-positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcus</td>
<td>Streptococcus, groups A, B, and D</td>
<td></td>
</tr>
<tr>
<td>Enterococcus</td>
<td>Enterococcus</td>
<td>Staphylococcus aureus</td>
</tr>
<tr>
<td>Listeria monocytogenes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaerobic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteroides species</td>
<td>Clostridium perfringens</td>
<td></td>
</tr>
<tr>
<td>Fusobacterium species</td>
<td></td>
<td>Peptococcus</td>
</tr>
<tr>
<td>Peptostreptococcus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23
Choice of antibiotics

- Lancefield group A beta-haemolytic Streptococcus
- E.Coli.
- Mixed infections: Gram-positive and Gram-negative: chorioamnionitis, endometritis
- Coliform infection: urinary sepsis, preterm premature rupture of membranes, and cerclage
- Anaerobes: Peptostreptococcus and Bacteroides spp.
Patient with intrapartum fever
oral temperature ≥38°C (100.4°F)

Perform history and physical examination

- Positive findings for nonobstetrical infection (eg, urinary tract, respiratory tract)
  
  Treat as appropriate

- Overheated room or maternal dehydration
  
  Lower room temperature or provide maternal hydration

- Risk factors (eg, protracted labor [by standard definitions], prolonged rupture of membranes [over 18 hours]) and physical exam supporting presumptive diagnosis of intraamniotic infection (eg, uterine tenderness, maternal and/or fetal tachycardia, malodorous amniotic fluid)
  
  Broad spectrum antibiotics (eg, ampicillin 2 grams every six hours and gentamicin 1.5 mg/kg every eight hours)

  No

  Fever unlikely to be related to epidural anesthesia

  Yes

  Fever could be related to epidural anesthesia, especially if epidural has been in place for four or more hours, but cannot exclude possibility of intraamniotic infection
Choice of antibiotics

Pregnancy asso ± related surgical procedures

- Infection of LSCS wound
- Episiotomy infection
- Mastitis
- Chorioamnionitis
- Postpartum endometritis
- Septic abortion
- Septic thrombophlebitis
- Puerperal sepsis

Mixed infections:
- E coli
- Gp B streptococci
- Enterococci
- Anaerobes

Ampicillin, gentamycin and metronidazole OR
Pipericillin tazobactam ± Clindamycin OR
Meropenem ± Clindamycin
Choice of antibiotics

Unrelated to pregnancy

Frequency in pregnancy

Lower UTI
Pyelonephritis

E Coli (70%)
Klebsiella and Enterobacter species (3%)
Proteus (2%), gram-positive organisms, including group B Streptococcus (10%)

Meropenem 1 g IV Q8H
Choice of antibiotics

- **Incidental infections during pregnancy**
  - **Community-acquired pneumonia**
    - **Vector borne:**
      - Scrub typhus
      - Dengue

- **Gastrointestinal infections**

- **Piperacillin tazobactam with Azithromycin ± Oseltamivir**

- **Azithromycin**
- **Adequate hydration**
- **Hydration**
Choice of antibiotics

Hospital-acquired infections

Catheter-related UTI
Thrombophlebitis
Wound infection

Pneumonia nosocomial
Ventilator-associated pneumonia
Central line-associated infection

UTI: meropenem
Thrombophlebitis: Cloxacillin/linezolid
Wound infection: cloxacillin / Linezolid
VAP, CRBSI: Meropenem with Colisitin
Scrub typhus in pregnancy: Maternal and fetal outcomes

Sudha J Rajan¹, Sowmya Sathyendra¹ and Alice J Mathuram²

Duration of illness >7 days: was an independent risk factors for a poor fetal outcome OR 2.46 (95% CI 1.6–85.9, p<0.01).

Table 3. Maternal and fetal outcomes of pregnancy with scrub typhus.

<table>
<thead>
<tr>
<th>Gestational age</th>
<th>n (%)</th>
<th>Fetal loss</th>
<th>Preterm delivery</th>
<th>Good fetal outcome</th>
<th>Mortality</th>
<th>ICU admission</th>
<th>Single</th>
<th>Multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>First trimester</td>
<td>5 (15.2)</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Second trimester</td>
<td>9 (27.3)</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Third trimester</td>
<td>19 (57.6)</td>
<td>8</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>15</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Total n (%)</td>
<td>33</td>
<td>14 (42.4)</td>
<td>3 (9.1)</td>
<td>15 (45.5)</td>
<td>1 (3)</td>
<td>23 (69.7)</td>
<td>18 (54.5)</td>
<td>5 (15.2)</td>
</tr>
</tbody>
</table>

ICU: intensive care unit.

*Pregnancy continued or delivered normal baby.
Dengue in pregnancy

19 case reports, 9 case series, and 2 comparison studies

**Maternal outcome:**
- high rates of cesarean deliveries (44.0%)  
- pre-eclampsia (12.0%)  
- 50% DHF  
- 30% DSS  
- 30% mortality

**Fetal outcome**
- preterm birth (16.1%)  
- low birth weight  
- Vertical transmission was described in 64.0% case reports and (12.6%) case series  
- 25% fetal loss  
- 37.5% NICU admission

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Maternal dengue and pregnancy outcomes: a systematic review.  
*Pouliot SH*, *Xiong X*, *Harville E*, *Paz-Soldan V*, *Tomashek KM*, *Breart G*, *Buekens P*.  

Spectrum of Maternofetal Outcomes during Dengue Infection in Pregnancy: An Insight.  
*Sharma S*, *Jain S*, *Rajaram S*.  
Medicine CME 2016 31
## Fetal Outcomes with Dengue

<table>
<thead>
<tr>
<th>Study</th>
<th>OR (95% CI)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friedman et al (2014)</td>
<td>2.20 (1.04-4.66)</td>
<td>34.9%</td>
</tr>
<tr>
<td>Tan et al (2008)</td>
<td>0.42 (0.10-1.73)</td>
<td>37.7%</td>
</tr>
<tr>
<td>Restrepo et al (2004)</td>
<td>1.06 (0.20-5.61)</td>
<td>11.7%</td>
</tr>
<tr>
<td>Alvarenga et al (2009)</td>
<td>2.91 (0.98-8.70)</td>
<td>14.96%</td>
</tr>
<tr>
<td>Angarita et al (2013)</td>
<td>36.56 (1.60-836.26)</td>
<td>0.62%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1.71 (1.06-2.76)</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

- Figure 3: Association between dengue during pregnancy and preterm birth. All studies (A). Only studies including women with clinically diagnosed dengue symptoms (B). OR: odds ratio.

<table>
<thead>
<tr>
<th>Study</th>
<th>OR (95% CI)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friedman et al (2014)</td>
<td>1.95 (1.01-3.75)</td>
<td>39.55%</td>
</tr>
<tr>
<td>Tan et al (2008)</td>
<td>0.89 (0.38-2.08)</td>
<td>40.02%</td>
</tr>
<tr>
<td>Restrepo et al (2004)</td>
<td>1.06 (0.25-4.59)</td>
<td>11.81%</td>
</tr>
<tr>
<td>Barroso et al (2009)</td>
<td>3.00 (0.47-19.04)</td>
<td>4.72%</td>
</tr>
<tr>
<td>Leite et al (2004)</td>
<td>0.66 (0.03-12.43)</td>
<td>4.35%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1.41 (0.90-2.21)</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

- Figure 4: Association between dengue during pregnancy and low birthweight or intrauterine growth restriction.
Dengue during pregnancy and adverse fetal outcomes: a systematic review and meta-analysis
Enny S Paixão, Maria Gloria Teixeira, Maria da Conceição N Costa, Laura C Rodrigues
www.thelancet.com/infection Published online March 3, 2016
http://dx.doi.org/10.1016/S1473-3099(16)00088-8
UTI in pregnancy

- the most common severe medical complication of pregnancy
- Asymptomatic bacteruria: 2-7% and 1/3rd would develop UTI
- asymptomatic bacteriuria at the first prenatal visit (12-16 weeks) (ACOG& US preventive task force)
- lower the incidence of pyelonephritis (OR 0.23, 95% CI 0.13-0.41)
- Risk factors:
  - history of UTI
  - presence of urinary tract anomalies
  - diabetes mellitus
  - hemoglobin S
  - preterm labor
Take home message

- The pregnant woman is a different host
- Impact of maternal mortality
Acknowledgements:

- Colleagues in Department of Obstetrics
- Sowmya Satyendra and friends in Medicine 3
- Patients in OG / OMC, and students
- Teachers and mentors
- Lord Jesus Christ

Thank you!