NEONATAL SEPSIS
Neonatal infections are estimated to cause about 1.6 million deaths worldwide and 40% of all neonatal deaths due to sepsis occur in developing countries.

Even though neonatal care has dramatically improved over the last decade, the overall as well as gestation specific mortality due to sepsis has not changed much due to more and more smaller babies surviving in the intensive care units.
Systemic bacterial infections of the newborn are termed as neonatal sepsis and include overwhelming infection without localization (Septicemia), or pneumonia, meningitis, urinary tract infection.
CLASSIFICATION

- Early onset sepsis
- Late onset sepsis
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Early onset sepsis</th>
<th>Late onset sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at onset</td>
<td>Birth to &lt;72hrs</td>
<td>&gt; 72 hrs of life</td>
</tr>
<tr>
<td>Maternal obstetric complications</td>
<td>Common</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Prematurity</td>
<td>Frequent</td>
<td>Varies</td>
</tr>
<tr>
<td>Manifestation</td>
<td>Multisystem</td>
<td>Multisystem / focal</td>
</tr>
</tbody>
</table>
EARLY ONSET SEPSIS

• Predisposing factors
  • Low birth weight
  • Prolonged rupture of membranes >24hrs
  • Chorioamnionitis (Foul smelling amniotic fluid, Maternal fever >37.9°C)
  • Multiple per vaginal examination
• Etiologic agents – organisms prevalent in maternal genital area.
  • E.coli, Group B streptococci.
LATE ONSET SEPSIS

• Predisposing factors
  • Prolonged NICU stay
  • Disruption of skin integrity with needle pricks and use of IV fluids.
  • Frequent use of broad spectrum antibiotics.
• Etiologic agents – organisms thriving in external environments of home or hospital. Transmitted through hands of care-providers.
• Klebsiella pneumoniae, CONS, MRSA.
May have either nonspecific signs and symptoms (e.g. not doing well, not accepting feeds) or focal signs of infection involving one system (abdominal distension) or it may be acute catastrophic deterioration with multi-organ dysfunction.

Various criteria have been devised to identify sepsis which are shown in the next slide.
## CLINICAL CRITERIA FOR DIAGNOSIS OF SEPSIS

<table>
<thead>
<tr>
<th>IMNCI</th>
<th>WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not able to feed</td>
<td>X( not able sustain such)</td>
</tr>
<tr>
<td>Not attaching to breast</td>
<td>-</td>
</tr>
<tr>
<td>Not sucking at all</td>
<td>-</td>
</tr>
<tr>
<td>Pus draining from ear</td>
<td>-</td>
</tr>
<tr>
<td>Redness around umbilicus</td>
<td>-</td>
</tr>
<tr>
<td>extending to the skin</td>
<td></td>
</tr>
<tr>
<td>Reduced movements</td>
<td>X( change in activity)</td>
</tr>
<tr>
<td>Lethargy or unconsciousness</td>
<td>X(not aroused by minimal stimulus)</td>
</tr>
<tr>
<td>Convulsions</td>
<td>X</td>
</tr>
<tr>
<td>Bulging fontanel</td>
<td>-</td>
</tr>
</tbody>
</table>

X: Means Presence

---

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## CLINICAL CRITERIA FOR DIAGNOSIS OF SEPSIS

<table>
<thead>
<tr>
<th></th>
<th>IMNCI</th>
<th>WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate &gt;60/min</td>
<td>x</td>
<td>X (divided by age group)</td>
</tr>
<tr>
<td>Severe chest indrawing</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Nasal flaring</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>Grunting</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>Crepitations</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>Temperature &gt;37.7°C (feels hot) or &lt;35.5°C (feels cold)</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

X: Means Presence
CLINICAL IMAGE OF BABY WITH SEPSIS
Gold standard remains isolation of organism from body fluids (blood or urine or CSF).

In cases of suspected sepsis following sepsis screen should be done and antibiotics should be started immediately after collecting blood culture sample.
DIFFERENTIAL DIAGNOSIS

• Hypothermia
• Hypoglycemia
• Metabolic encephalopathy
INVESTIGATIONS

- Haemogram
- IT ratio
- Micro ESR
- CRP
- Blood culture- 1ml blood in 10ml broth
- Chest X-ray
- Blood sugar
INVESTIGATIONS (CONT..)

• Positive sepsis screen - 2 or more positive tests as given below.

  • TLC ( < 5,000 or > 20,000/cu.mm),
  • Neutropenia- Absolute neutrophil count (<1800/cu.mm)
  • Immature neutrophil (band cells) to total neutrophil (I/T) ratio > 0.2
  • C-reactive proteins- positive
  • Micro ESR- (ESR > 15mm at 1st hr.)
Late onset sepsis- all above plus

- CSF- biochemistry, gram stain, culture
- Urine- microscopy, culture

Following investigations should be done if other systemic involvement is noted e.g. X ray abdomen.
TREATMENT – SUPPORTIVE CARE

☞ Provide warmth, ensure consistently normal temperature

☞ Provide bag and mask ventilation with oxygen if breathing is inadequate

☞ Start oxygen by hood or mask, if cyanosed or grunting

☞ Provide gentle physical stimulation, if apneic.

☞ Start intravenous line

   Infuse glucose (10%) 2ml/kg stat (if hypoglycemic)
TREATMENT – SUPPORTIVE CARE

- If perfusion is poor as evidenced by capillary refill time (CRT) of more than 3 seconds, manage shock.
- Inj. Vitamin K 1mg IM
- Consider use of dopamine if perfusion is persistently poor.
- Avoid enteral feed if very sick, give maintenance fluid intravenously.
## Antibiotic therapy for sepsis

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Each dose mg/kg/dose</th>
<th>Frequency</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>50</td>
<td>12 hrly</td>
<td>8 hrly</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>5</td>
<td>24hrly</td>
<td>24hrly</td>
</tr>
<tr>
<td>Antibiotic</td>
<td>Each dose</td>
<td>Frequency</td>
<td>Route</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>Cefotaxim</td>
<td>50</td>
<td>12 hrly</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 hrly</td>
<td></td>
</tr>
<tr>
<td>Gentamycin</td>
<td>5</td>
<td>24 hrly</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hrly</td>
<td></td>
</tr>
</tbody>
</table>
DURATION OF ANTIBIOTICS

If not improving in 2-3 days the antibiotic treatment may need to be changed, preferably as per microbial culture reports.

Blood culture negative sepsis - 7 to 10 days
Blood culture positive sepsis - 10 to 14 days
Meningitis - 21 days.
RECENT ADVANCES

- IVIG
- Colony stimulating factor
- Exchange transfusion

All these modalities need further studies.
NEONATAL SEPSIS (CONT..)

Superficial

- Conjunctivitis
- Pustules
- Umbilical sepsis
- Mastitis Neonatorum
- Oral thrush
MASTITIS NEONATORUM

Term baby, both sexes

- Engorgement of breast due to effect of transplacentally transferred progesterone and estrogens.
- This hypertrophy disappears spontaneously but local massage and fomentation and temptation to express milk leads to abscess formation.
- Treatment with parenteral antibiotics and surgical drainage.
CLINICAL IMAGE: MASTITIS NEONATORUM
PUSTULES

• Seen over scalp, neck, axillae and groin.
• Caused by staphylococci.
• Can be punctured with sterile needle and clean with spirit / betadine.
• Treatment with local application of antibiotics.
• If increasing in size and number then oral antibiotics e.g. cloxacillin
CLINICAL IMAGE: PUSTULES
ORAL THRUSH

 CAUSED by Candida albicans

 White patches with erythematous margins distributed over the tongue and buccal mucosa.

 Unlike milk curds, patches of thrush are adherent and they often bleed when attempts are made to remove.

 Treatment – local application of gentian violet or nystatin or clotriamazole after each feed.

 Screen mother for mammary candidiasis and treat.
CLINICAL IMAGE: ORAL THRUSH
UMBILICAL SEPSIS

• Caused by usual skin flora i.e. staphylococci.

• Redness and edema at the base of the cord and a foul smelling purulent discharge.

• presence of mucoid discharge on the stump and even isolation of bacteria are not indicative of umbilical sepsis unless there is clinical evidence of periumbilical inflammation or there are pus cells in the exudate.

• Treat with local application of antibiotics

• With evidence of systemic spread- parenteral antibiotics.

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CONJUNCTIVITIS

• Gonococcal conjunctivitis less commonly seen.

• Usually caused by organisms present in maternal flora or chlamydia.

• Purulent conjunctivitis can be treated with Neosporin or chloramphenicol ophthalmic drops

• Eye cleaning with water

• Nasolacrimal duct massage
PREVENTION

• Good antenatal, intranatal and postnatal care
• Clean attendant’s hand (washed with soap)
• Clean delivery surface
• Clean cord cutting instrument (i.e. razor, blade)
• Clean string to tie cords
• Clean cloth to wrap the baby
• Clean cloth to wrap the mother
PREVENTION (CONT..)

• Prevent overcrowding

• Ensure early breastfeeding

• Hand washing
PREVENTION – HAND WASH

Before touching any baby -

• Sleeves should be rolled above the elbows. Rings, watches and jewellery should be removed.

• 1st hand wash- up to elbows with a thorough scrub for 2 minutes, all areas including the under surface of well trimmed nails.

• In between patients hand wash for 20 seconds up to elbows.
HAND WASHING IN 6 STEPS

1. Wash hands with soap and water.
2. Rub hands together.
3. Rinse hands with water.
4. Dry hands with clean towel.
5. Use hand sanitizer if soap and water not available.
6. Clean nails and cuticles thoroughly.

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SUMMARY

• Commonest cause of neonatal mortality

• High index of suspicion

• Early diagnosis

• Prompt treatment
REFERENCES

• Nelson textbook of pediatrics 18th edition

• Integrated Management of Neonatal and Childhood Illnesses

• Navajaat Shishu Suraksha Karyakram
THANK YOU