Sick Young Infant

Infant Mortality
Overview

Neonatal Mortality
Global Estimates • Causes

IMCI Guidelines
Infection-related Mortality & Morbidity
First Week of Life

WHO Multi-center Study
Rationale • Description

11-item Model to Predict Serious Disease

Clinical Features • Positive Blood Culture Isolates
Gram Positive & Negative Organisms

Conclusions
Overview

- Major improvements in “under 5” mortality, mostly after neonatal period
- 5 million newborn deaths each year, 98 percent in developing countries (still an underestimate)
- About 2/3 of the infant mortality occurs in the first month of life
  - from asphyxia, birth trauma, infection, prematurity and malformations during first week
  - from sepsis, pneumonia, meningitis, diarrhoeal disease and tetanus during remainder of first month
Overview

- 126 million live births
- 8 million infant deaths
- 5 million neonatal deaths
- 3.3 million early neonatal deaths
# Neonatal Mortality

## Global Estimates

<table>
<thead>
<tr>
<th>Region</th>
<th>Live births (thousands)</th>
<th>Neonatal deaths (thousands)</th>
<th>Neonatal mortality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>30,700</td>
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<tr>
<td>Asia</td>
<td>83,400</td>
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</tr>
<tr>
<td>Latin America</td>
<td>12,000</td>
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<td>Oceania</td>
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<td>Europe</td>
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<td>8</td>
</tr>
<tr>
<td>North America</td>
<td>4,400</td>
<td>26</td>
<td>6</td>
</tr>
</tbody>
</table>

Weekly Epidemiological Record, October 1996
• Improving maternal care during pregnancy, delivery and the postnatal period could reduce mortality
  - practising clean delivery
  - basic newborn resuscitation when needed
  - prevention of hypothermia
  - early and exclusive breast feeding
  - management of syphilis and tetanus vaccination

• However, most deliveries occur in the home and are supervised by traditional birth attendants, or are unattended.
**5 Million Deaths Per Year**

- Infection - 1.78 million
- Birth asphyxia/trauma - 1.38 million
  - good antenatal care and safe supervised deliveries could prevent
- Prematurity - 1.15 million
  - very difficult to improve without major improvements in the socioeconomic situation
- Congenital anomalies - 0.52 million
- Other perinatal causes - 0.17 million
Neonatal Mortality

Causes

- Infections make up a major portion of the preventable and treatable causes of neonatal mortality
  - Pneumonia - 750,000
  - Tetanus - 350,000 (declining rates)
  - Sepsis - 300,000
  - Diarrhoea - 150,000 (but with improvement due to exclusive breastfeeding)
  - Meningitis - 50,000
IMCI Guidelines

Infection-related Mortality & Morbidity

- Directly or indirectly, IMCI addresses all the major infection-related causes of mortality and morbidity in the young infant.
  - Clinical indicators to identify and treat serious bacterial infection and diarrhoeal disease
  - Prevention of tetanus through the maternal tetanus toxoid immunization
  - Addressing the issues of prematurity and low birth weight through assessment and management of feeding problems
  - Prevention of ARI, diarrhoeal diseases and other infectious and nutritional diseases through promotion of exclusive breastfeeding
IMCI Guidelines

First Week of Life

• IMCI guidelines do not include the first week of life because:
  – mortality usually related to pregnancy/delivery
  – entails expanding IMCI to include preventive measures during labor and delivery
  – maternal recognition of these conditions is poor
  – sick newborn baby is often kept at home
Rationale

- Lack of data from developing countries on serious bacterial infections in the young infant
- Prior hospital studies identified mostly gram negative bacilli
- Differentiation from nosocomially-acquired and community-acquired pneumonia was difficult
- Ability to identify antibiotics based on current organisms and their sensitivity patterns was important
WHO Multi-center Study

Description

- Four developing countries

- 4,552 sick infants under 90 days of age
  - All infants with signs of infection investigated
  - Full history and examination on every infant
  - Outcome of all cases recorded
Sick Young Infant

WHO Multi-center Study

11-item Model to Predict Serious Disease

- Four Vital Signs (age, temperature, respiratory rate, weight for age z score)

- Seven Clinical Findings
  - No arousal with minimal stimulation
  - History of change and activity
  - History of convulsions
  - Inability to suck
  - Definite lower chest wall indrawing
  - Crepitations
  - Cyanosis
WHO Multi-center Study

Positive blood Culture Isolates

- 167 infants had proven bacterial infection

- *Staphylococcus aureus, Streptococcus pneumoniae* and Group A β-hemolytic Streptococcus most common cause (60 percent)

- *E. coli, Salmonella* spp. and other gram negative organisms accounted for a much lower proportion than expected

- *Streptococcus pneumoniae* alone was almost as important as *E. coli* and *Salmonella* spp. combined
Two important conclusions:

- **Gram positive cocci** were more important than gram negative bacilli in causing serious bacterial infections in the young infant.

- **S.pneumoniae** are a significant cause of serious bacterial infection in young infants, a previously unrecognized observation.
WHO Multi-center Study

Clinical Features

• 5.4% of the infants in the study (249) died:
  – Blood culture positive (31% died)
  – Blood culture negative (9% died)

• Death associated with:
  – Positive CSF or blood culture
  – Hypoxaemia
  – Major chest radiographic abnormality
  – Abnormal white cell count (<5.5 or >22)
WHO Multi-center Study

Gram Positive Organisms

- Group A β Hemolytic *Streptococcus* and *Staphylococcus aureus* common cause of neonatal sepsis and death
- Group B *Streptococcus* rarely isolated in the study
- *Streptococcus pneumoniae* caused 33 percent of deaths
- Group A β Hemolytic *Streptococcus* caused 14 percent,
WHO Multi-center Study

Gram Negative Organisms

- Gram negative organisms were less common but accounted for higher mortality
- Mostly in undernourished younger infants
- Common in hospital setting (nosocomial transmission), but rarely reported in WHO multi-center study
- Isolated most commonly during the first month of life
Conclusion

- Infection is a major contributor to high mortality rates in very young infants in developing countries.
  - Most likely bacterial causes:
    - *Streptococcus pneumoniae*
    - Group A *Streptococcus*
    - *Staphylococcus aureus*
    - Gram negative enteric organisms, especially *E. coli*
WHO Multi-center Study

Conclusion

- Benzylpenicillin and gentamicin for *Streptococcus pneumoniae*, Group A *Streptococcus* and *E. coli*.

- Cloxacillin for *Staphylococcus aureus*, other gram positive cocci.
Severe Persistent Diarrhoea

Classification

• Refer those who have persistent diarrhoea **AND** who are also dehydrated to hospital
  – mortality is 8 to 10 times higher than that with acute diarrhoea
  – may need nutritional rehabilitation
  – may need investigation for immune deficiencies and/or resistant bacteria
Persistent Diarrhoea

Therapy

• Correct Dehydration

• Correct Nutritional Problems
  – Reduce disaccharides
  – Increase energy intake
  – Supplement micronutrients (possibly)

• Give Antibiotics for Dysentery

• Avoid These Therapies
  – Antibiotics for watery diarrhoea
  – Anti-motility agents
  – Diluted feeds