Hepatitis E in South Asia:
An outbreak in Bangladesh as a case study

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Introduction to Bangladesh

- Country of 140 million people
- Dhaka is the capital with 14 million people
- High population density
- 70% of population lives on <US$2 per capita per day
Outbreak in East Arichpur

- Early January 2009, 10 women of reproductive age died from jaundice since August
- Surveyed households for jaundice, all deaths
- Serological tests for hepatitis A and E
- Water quality testing
• Low-income settlement on the banks of the Turag River
• Garment workers
• >50,000 people, 100,000 per sq km
• 20% migration each year
Jaundice in East Arichpur

• Jaundice = yellow eyes or skin
• 2760 people reported new onset jaundice since August (5.4%)
• 18 deaths (0.7%)
  – 10 women, 4 men,
    2 neonates, 2 still births
• 464 ill at the time of the survey
Socio-demographics of patients

• 51% male
• Mean age 25 years, range 0-98

<table>
<thead>
<tr>
<th>Age group</th>
<th>n(%)</th>
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</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>127 (4.6)</td>
</tr>
<tr>
<td>5-14</td>
<td>422 (15)</td>
</tr>
<tr>
<td>15-34</td>
<td>1539 (56)</td>
</tr>
<tr>
<td>35-59</td>
<td>615 (22)</td>
</tr>
<tr>
<td>60 +</td>
<td>53 (1.9)</td>
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</tbody>
</table>
Clinical presentation of adult deaths and neighbors (n=78)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>N (%)</th>
</tr>
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<tbody>
<tr>
<td>Fever</td>
<td>70 (91)</td>
</tr>
<tr>
<td>Yellow eyes</td>
<td>76 (99)</td>
</tr>
<tr>
<td>Yellow skin</td>
<td>62 (81)</td>
</tr>
<tr>
<td>Anorexia</td>
<td>67 (87)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>41 (53)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>18 (23)</td>
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Hepatitis E antibodies common

<table>
<thead>
<tr>
<th>Anti-HEV IgM</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>3</td>
</tr>
<tr>
<td>Negative</td>
<td>3</td>
</tr>
<tr>
<td>Total n (%)</td>
<td>6 (14)</td>
</tr>
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</table>
New jaundice cases per week from August 1 to January 12
Municipal water distribution

Hand pumps connected to main water distribution lines

Plastic pipes run through open sewers
### Is it the water?

<table>
<thead>
<tr>
<th>Water samples</th>
<th>Total coliforms/ml</th>
<th>Fecal coliforms/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>City distribution pumps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pump 2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shallow tube wells</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Household water taps (median, range)</td>
<td>71 (16-13,000)</td>
<td>38 (12-12,000)</td>
</tr>
</tbody>
</table>

WHO standards for drinking water- zero coliforms
Anthropological study

- Health care seeking behaviors
  - Primarily seek care from informal providers

- Causal explanations of disease
  - Fecal contamination of environment
  - Not associated with drinking water

- Water distribution disruption early in the year
How does this outbreak compare to what is known about HEV epi?

- Outbreak
- Predominantly adults
- Associated with contaminated water
- Higher case fatality during pregnancy
Lingering questions

• Isolated event?
  – Highly unlikely. Adjacent community also experiencing high (2.8%) of jaundice
  – Risk factor study in Dhaka focused on endemic disease- diagnoses occur year-round
    • Of 58 cases identified from Nov through Jan, 20% associated with clusters

• Risk of death?
  – East Arichpur 7 per 1000
  – West Arichpur 1 per 1000
More questions

• Role of urbanization in Hepatitis E epidemiology?
  – Migration and transmission
  – “Everyone who comes to Dhaka gets jaundice”

• POU water treatment
  – Will chlorination work?
  – Exposures outside the home

• Contributions to maternal and neonatal mortality?
Neonatal deaths in urban Dhaka

- Survey on all < 5 child deaths for preceding 5 years, 257 deaths
- 18/150 (12%) neonatal deaths associated with maternal jaundice
Road to prevention

• Better data on burden

• Vaccine?

• Behavior change?

• Infrastructure?
Hepatitis E case finding in Dhaka

• Case-control study began in November 2008

• 58 cases enrolled from private lab
  – Median age 28, range 7-60 years

• Community follow-up identified clusters in 11/58 (19%)
  – Family, office colleagues, hostel residents