Surveillance for Patients with Acute Febrile Illness in Egypt, GEIS Program at NAMRU-3

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Pathogens causing AFI are important public health problems in Egypt
  - Typhoid is one of the most frequently reported diseases
  - Little information on brucellosis

Surveillance for patients with AFI is complex
  - Wide variety of organisms
  - Limited laboratory capacity
Objectives
AFI Surveillance - Egypt, March 99- August 01

• Upgrade laboratory and epidemiology capacity in the MOH for the prevention and control of infectious diseases causing AFI

• Characterize epidemiology of infectious agents causing AFI

• Identify risk factors for disease to target prevention strategies
Methods
AFI Surveillance - Egypt, March 99- August 01

- Clinical case finding
  - Infectious Disease Hospitals (n=13)
  - Clinicians trained:
    identify AFI cases
    blood culture on admission
Methods
AFI Surveillance - Egypt, March 99- August 01

- Epidemiology
  - Standardized surveillance form
demographic, clinical, and risk factor data

  - Computerized database

  - Monthly site visits

  - Risk factors were evaluated by comparing patients with brucellosis to all other patients admitted with AFI
Laboratory Methods
AFI Surveillance - Egypt, March 99- August 01

• Blood culture
  - 5-10 cc of blood in biphasic media
  - checked daily for growth
  - 3 week incubation time at 37°C

• Serology
  - WIDAL for typhoid fever
  - Brucella tube agglutination

• Special studies
  - arbovirus infections, selected rickettsial pathogens
Clinical case definition
- any patient > 4 years of age
- fever for > 2 days
- admission temperature > 38.5º C
- no other identified cause of fever
or
- any patient with clinical diagnosis of typhoid fever or brucellosis
Case Definitions for Typhoid Fever, Brucellosis, and Arbovirus Infections

Typhoid
- Probable: tube agglutination widal titer $\geq 1/160$
- Confirmed: isolation of *S. typhi*

Brucellosis
- Confirmed: isolation of *brucella Spp.*
- Tube agglutination $\geq 1:160$

Arbovirus infections
- IgM antibody to RVF, Sandfly, Sindbis, West Nile viruses
Results: Laboratory Diagnosed Etiologies of Acute Febrile Illness

4906 Patients Evaluated, March 99- August 01

67% No lab dx for AFI
16% Typhoid fever *
11% Brucellosis
4% Arbovirus infection**
2% Other BSI

* Confirmed and probable cases
** Representative sample
Results: Other Etiology of AFI

3330 Patients Diagnosed clinically
March 99- August 01
### Characteristics of Patients with Typhoid Fever and Brucellosis

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Typhoid</th>
<th>Brucellosis</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age (yrs)</td>
<td>19.8</td>
<td>32.2</td>
<td>25</td>
</tr>
<tr>
<td>% Males</td>
<td>49.6</td>
<td>64.8</td>
<td>58</td>
</tr>
<tr>
<td>% Case fatality</td>
<td>0.5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Mean Days of Hospitalization</td>
<td>10.1</td>
<td>8.6</td>
<td>6.9</td>
</tr>
<tr>
<td>Mean Interval (onset-admission)</td>
<td>9.3</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>% received AB prior to admission</td>
<td>53</td>
<td>54</td>
<td>59</td>
</tr>
</tbody>
</table>
Typhoid Seasonal Distribution
Acute Febrile Illness Surveillance (AFI) -- Egypt, March 99- August 01

No. Cases

Abassia
Imbaba
Alex
Mahalla
Assiut
Aswan

Month

1999
2000
2001
Brucellosis Seasonal Distribution

Acute Febrile Illness Surveillance (AFI) -- Egypt, March 99- August 01

No. Cases

Month

1999 2000 2001

M A M J J A S O N D J F M A M J J A
Percent of AFI Patients with Typhoid Fever or Brucellosis by Hospital

- Qena: 68% Typhoid, 7% Brucella
- Zagazig: 56% Typhoid, 12% Brucella
- Abbasia: 34% Typhoid, 10% Brucella
- Port Said: 20% Typhoid, 6% Brucella
- Imbaba: 15% Typhoid, 4% Brucella
- Assiut: 12% Typhoid, 3% Brucella
- Sohag: 10% Typhoid, 2% Brucella
- Aswan: 9% Typhoid, 2% Brucella
- Barha: 8% Typhoid, 1% Brucella
- Fayoum: 7% Typhoid, 1% Brucella
- Mahalla: 6% Typhoid, 1% Brucella
- Shebin: 4% Typhoid, 1% Brucella
- Alex: 3% Typhoid, 1% Brucella

n = 4906
Typhoid = 794
Brucellosis = 533
<table>
<thead>
<tr>
<th>Symptom</th>
<th>No. typhoid (%)</th>
<th>No. Brucella (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>792 (100%)</td>
<td>532 (100%)</td>
</tr>
<tr>
<td>Undulant fever</td>
<td>294 (37%)</td>
<td>389 (73%)</td>
</tr>
<tr>
<td>Headache</td>
<td>655 (83%)</td>
<td>476 (89%)</td>
</tr>
<tr>
<td>Arthralgia</td>
<td>249 (31%)</td>
<td>359 (67%)</td>
</tr>
<tr>
<td>Myalgia</td>
<td>302 (38%)</td>
<td>355 (67%)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>384 (48%)</td>
<td>212 (40%)</td>
</tr>
<tr>
<td>Convulsions</td>
<td>231 (31%)</td>
<td>175 (34%)</td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>256 (32%)</td>
<td>143 (27%)</td>
</tr>
</tbody>
</table>
## Exposures associated with Brucellosis

### Age adjusted Prevalence Ratio (I)

<table>
<thead>
<tr>
<th>Animal Contact</th>
<th>No. exposed Brucellosis n= 511</th>
<th>%</th>
<th>Non- Brucellosis n= 4246</th>
<th>Age Adjusted PR</th>
<th>Confidence limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camel</td>
<td>21</td>
<td>4%</td>
<td>36</td>
<td>1%</td>
<td>5</td>
</tr>
<tr>
<td>Sheep</td>
<td>191</td>
<td>37%</td>
<td>657</td>
<td>16%</td>
<td>3.3</td>
</tr>
<tr>
<td>Buffalo</td>
<td>161</td>
<td>32%</td>
<td>637</td>
<td>32%</td>
<td>2.6</td>
</tr>
<tr>
<td>Cattle</td>
<td>152</td>
<td>30%</td>
<td>635</td>
<td>15%</td>
<td>2.4</td>
</tr>
<tr>
<td>Donkey</td>
<td>98</td>
<td>19%</td>
<td>430</td>
<td>10%</td>
<td>2.1</td>
</tr>
</tbody>
</table>
### Exposures associated with Brucellosis

**Age adjusted Prevalence Ratio (II)**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>No. exposed</th>
<th>%</th>
<th>Age adjusted PR</th>
<th>Confidence limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brucellosis</td>
<td>Non-Brucellosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n= 533</td>
<td>n= 4373</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handling animal abortus</td>
<td>99</td>
<td>19%</td>
<td>3.2</td>
<td>2.5 – 4.1</td>
</tr>
<tr>
<td>Slaughtering animal</td>
<td>72</td>
<td>14%</td>
<td>2.4</td>
<td>1.6 – 2.8</td>
</tr>
<tr>
<td>Handling raw meat</td>
<td>87</td>
<td>16%</td>
<td>2.0</td>
<td>1.4 – 2.3</td>
</tr>
<tr>
<td>Drink unpasteurized milk</td>
<td>166</td>
<td>31%</td>
<td>1.9</td>
<td>1.4 – 2.1</td>
</tr>
<tr>
<td>Eating soft cheese</td>
<td>395</td>
<td>74%</td>
<td>1.6</td>
<td>1.3 – 1.9</td>
</tr>
</tbody>
</table>
Conclusion

- Laboratory-based surveillance is important for proper diagnosis of patients with AFI

- *S. typhi* infection as a cause of AFI varies by region
  - most common in school-aged children
  - more common in summer months

- Brucellosis- as a cause of AFI does NOT vary by region
  - more common in adults, males, and animal handlers
  - more common in summer months
  - risk factors include exposure to animals, eating unpasteurized dairy products
Limitations

- Widal test is unreliable for diagnosis of typhoid fever
- Lab capacity, performance and supply availability at study sites is not constant
- Hospital based surveillance captures only a fraction of cases
Recommendation

- Institutionalize the surveillance system for AFI to include all infectious disease hospitals
- Enhance lab based surveillance in the participating sites
- Enforce food supervision regarding milk and milk products
- Health education for animal handlers