A Large Outbreak of Typhoid Fever caused by Consuming Contaminated Water and Street-vended beverages Kampala, Uganda Jan-Jun 2015

Steven Ndugwa Kabwama, BSc FST, MSc PH
Strange disease reported in Kampala
Feb 2015

Death of index patient

Index patient hospitalised

Symptoms:
- Abdominal pain
- Prolonged fever
- Jaundice

Start of investigation

Reported to city authority and MoH

Feb 2nd 3rd 4th 5th 6th 7th 8th 9th 10th
Objectives

- Identify nature of illness
- Establish mode of transmission and risk factors
- Inform control measures
Initial investigation indicated typhoid

- Doctor: Index patient had severe abdominal pain and (+) Widal Test
- A hospitalised patient had similar symptoms
  - Many of her colleagues were sick
  - Her husband had similar symptoms, took antibiotics and got better
- Community interviews and observations identified other people with similar symptoms
Case definition

- **Suspected case:**
  - Onset of fever (≥37.5 °C) for ≥3 days from 1 Jan 2015, with headache, abdominal pain, negative malaria test or failure to respond to anti-malaria treatment, and ≥2 of the following symptoms: diarrhea, nausea or vomiting, constipation, or fatigue in a resident of Kampala or neighbouring districts

- **Probable case:** Suspected case plus TUBEX test (+)

- **Confirmed case:** Suspected case plus *Salmonella Typhi* (+) from blood culture
Case finding

- Active case finding in areas where outbreak had been reported
- Setting up free treatment centers throughout the city
- Media outreach
Case count  12 Jun 2015

- 10230 Suspected cases
- 1038 Probable cases
- 56 Confirmed cases
### Attack rates by sex and age-group

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Attack Rate/1000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
</tr>
<tr>
<td>Female</td>
<td>8.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6.5</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;15</td>
<td>2.0</td>
</tr>
<tr>
<td>15 – 59</td>
<td>12</td>
</tr>
<tr>
<td>&gt;59</td>
<td>2.0</td>
</tr>
</tbody>
</table>
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Kampala, Uganda, Jan-Jun 2015
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Epi curve of suspected typhoid case patients, Jan-Jun 2015

Death of index patient

Start of investigation

# of cases
Food-borne or water-borne?

- Case distributed throughout Kampala
- Cases reported buying unbottled drinks at unreasonably low price
- Hypothesis-generating interviews: Patients more likely to get drinking water from workplace

Strong suspicion of water-borne outbreak
Case-control study

- 33 cases
- 78 controls
- Frequency-matched by sex and place of work
- Info on water and food intake
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Consuming locally made drinks and water associated with disease

<table>
<thead>
<tr>
<th>Usually drank…</th>
<th>OR_{M-H} (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaveera water (Y/N)</td>
<td>8.9 (1.6-49)</td>
</tr>
<tr>
<td>Butunda (Y/N)</td>
<td>4.6 (1.9-11)</td>
</tr>
<tr>
<td>Obushera (Y/N)</td>
<td>2.8 (0.76-10)</td>
</tr>
<tr>
<td>Munanansi (Y/N)</td>
<td>2.0 (0.74-5.2)</td>
</tr>
</tbody>
</table>

Bottled water and food items were not associated with disease
Higher odds from consuming more types of drinks

<table>
<thead>
<tr>
<th># of types of locally made drinks</th>
<th>% cases (n=33)</th>
<th>% controls (n=78)</th>
<th>OR (95%CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>36</td>
<td>64</td>
<td>1 (Ref)</td>
</tr>
<tr>
<td>1</td>
<td>27</td>
<td>26</td>
<td>1.9 (0.68-5.1)</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>9</td>
<td>3.0 (0.80-11)</td>
</tr>
<tr>
<td>3-4</td>
<td>21</td>
<td>1</td>
<td>29 (3.2-260)</td>
</tr>
</tbody>
</table>

*Chi-square test for linear trend: Chi-square=14.65, p=0.00013
Butunda - passion fruit juice
Laboratory investigation

- 56 blood samples (+) for *Salmonella typhi* by culture
- All drinks and water heavily contaminated with faecal matter
  - 9/9 juice samples
  - 18/20 water samples
Conclusions

- Large outbreak of typhoid fever
- Caused by consuming locally made drinks, made with contaminated underground water
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Public health actions taken

- Provided safe water
- Free water chlorination products
- Closed off underground water sources
- Health education
  - Drink only boiled water
  - Avoid drinking unclean water and juice from markets

# of cases

Date of Onset

Interventions

Death of index patient

Start of investigation

Date of Onset

# of cases

0 100 200 300 400 500 600 700

01-Jan-15 01-Feb-15 01-Mar-15 01-Apr-15 01-May-15 01-Jun-15
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Kampala, Uganda, Jan-Jun 2015

Acknowledgements

- PHFP Cohort 2015
- Ministry of Health
- MakSPH
- US CDC
- PHFP
- NWSC
- KCCA
### Other variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sealed Water</td>
<td>0.6 (0.2-1.7)</td>
</tr>
<tr>
<td>Unsealed Water</td>
<td>1.8 (0.7-4.8)</td>
</tr>
<tr>
<td>Lunch food Market</td>
<td>0.3 (0.1-1.1)</td>
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<tr>
<td>Breakfast food Market</td>
<td>0.2 (0.1-0.9)</td>
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